

REGISTRATION FOR MODIFICATION OF AN
EXISTING TRUE MINOR OIL AND NATURAL
GAS SOURCE IN INDIAN COUNTRY PART 2
APPLICATION FOR HORSE CAMP 2-11H & 101-
11H AND HORSE CAMP WEST 2MBH & 2TFH
OIL AND GAS PRODUCTION FACILITY, DUNN
COUNTY, NORTH DAKOTA

JULY 2019

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**REGISTRATION FOR MODIFICATION OF AN EXISTING TRUE
MINOR OIL AND NATURAL GAS SOURCE IN INDIAN
COUNTRY PART 2 APPLICATION FOR HORSE CAMP 2-11H
& 101-11H AND HORSE CAMP WEST 2MBH & 2TFH OIL AND
GAS PRODUCTION FACILITY, DUNN COUNTY, NORTH
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CONTENTS

1	Introduction	1
2	General Facility Information.....	2
3	Process Description	4
4	Emission Calculation Methodology	5
	4.1 Potential to Emit	5
	4.2 Estimated Actual Annual Emissions.....	6
	4.3 Emission Units.....	6
	4.3.1 Crude Oil/Condensate Storage Tanks.....	6
	4.3.2 Produced Water Tanks.....	7
	4.3.3 Truck Loading.....	7
	4.3.4 Separators.....	7
	4.3.5 Fugitive Leaks.....	7
	4.3.6 Flares.....	8
	4.3.7 Engine	8
5	Emission Summary.....	9
	5.1 Potential to Emit	9
	5.2 Estimated Actual Annual Emissions.....	9
6	FIP for Oil and Natural Gas Well Production Facilities – Fort Berthold Indian Reservation	11

Figures

	Figure 1. General Location of the Facility.....	3
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Tables

	Table 1. Well Information.....	2
	Table 2. Location Information	2
	Table 3. Well Production Data for Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Facility	5
	Table 4. Potential to Emit in Tons per Year	9
	Table 5. Estimated Actual Annual Emissions in Tons per Year.....	10
	Table 6. Requirements Referenced in the FIP for True Minor Sources in Indian Country in the Oil and Natural Gas Industry Applicability Determination	11
	Table 7. Review of FIP for Oil & Gas Facilities in Fort Berthold Reservation.....	13

Appendices

Appendix A. *Registration for New True Minor Oil and Natural Gas Sources and Minor Modifications at Existing True Minor Oil and Natural Gas Sources Part 2 Form*

Appendix B. Emission Calculations

Appendix C. Supporting Documentation

1 INTRODUCTION

PetroShale (US), Inc. (PetroShale) is submitting the Registration for New True Minor Oil and Natural Gas Source form and application to the U.S. Environmental Protection Agency (EPA) Region 8 to modify the existing Horse Camp 2-11H and 101-11H 2-well pad facility by adding the Horse Camp West 2MBH and 2TFH wells, creating a 4-well pad oil and gas production facility (Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH) (the facility). The required EPA registration form Part 2 is being submitted in accordance with the Federal Minor New Source Review (NSR) Rule codified at 40 CFR §49.151 and is included in Appendix A. The Registration for New True Minor Oil and Natural Gas Sources and Minor Modifications at Existing True Minor Oil and Natural Gas Sources Part 1 form was submitted to the EPA on November 30, 2018.

The existing Horse Camp 2-11H well was completed September 30, 2011 and the Horse Camp 101-11H well was completed October 2, 2011 and were registered with the EPA by EOG Resources, Inc. PetroShale acquired these wells on June 2, 2017. PetroShale is adding two new wells, Horse Camp West 2MBH and 2TFH, within 1/4 mile of the existing Horse Camp 2-11H and 101-11H facility. The Horse Camp 2-11H and 101-11H wells resumed operation May 30, 2019. Construction commenced on the Horse Camp West 2MBH and 2TFH wells at the end of October 2018. The Horse Camp West 2MBH well was completed November 16, 2018. The Horse Camp West 2TFH well was completed November 23, 2018. Because the existing facility is located within the boundaries of the Fort Berthold Reservation and the modification commenced after October 3, 2016, the facility is registering a modification to an existing true minor oil and natural gas source per the Federal Indian Country Minor NSR Rule. All four wells are planned to operate at the facility.

Applicable attachments requested on the EPA registration form are included within this application. Section 2 of this application provides general facility information, a brief site description, and the site location. Section 3 provides a detailed process description of the operations and a discussion of the emission sources located at the newly modified existing facility. Section 4 provides a discussion of the methodology used for the emission calculations. Section 5 presents the potential to emit (PTE) and estimated actual annual emissions from the facility and compares the emissions to minor and major NSR thresholds. Section 6 reviews the requirements of the Federal Implementation Plan (FIP) for True Minor Oil and Natural Gas Sources in Indian Country and determines the applicability of each requirement to the facility. The Registration for New True Minor Oil and Natural Gas Sources and Minor Modifications at Existing True Minor Oil and Natural Gas Sources Part 2 form is included in Appendix A. Emission calculations are included in Appendix B. Supporting documentation, such as an oil and gas analyses, EPA Tanks 4.0.9d, and E&P TANK V2.0 modeling inputs and outputs, is included in Appendix C.

2 GENERAL FACILITY INFORMATION

Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH is a 4-well pad oil and gas facility. The facility operates year-round and includes equipment and related processes used in the extraction, production, separation, and storing the oil from the wells. This equipment has the potential to release regulated pollutants to the atmosphere. The facility is classified under Standard Industrial Classification (SIC) Code 1311 (crude petroleum and natural gas) and North American Industry Classification System (NAICS) Code 211111 (crude petroleum and natural gas extraction). Information concerning each well is presented in Table 1.

Table 1. Well Information

Well Name	API Number	Completion Date	Status
Horse Camp 2-11H	33-025-01237	9/30/2011	Producing
Horse Camp 101-11H	33-025-01236	10/2/2011	Producing
Horse Camp West 2MBH	33-025-03507	11/16/2018	Producing
Horse Camp West 2TFH	33-025-03508	11/23/2018	Producing

Source: North Dakota Industrial Commission, Department of Mineral Resources, Oil and Gas Division

The Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH site is located within the boundaries of the Fort Berthold Reservation, off of BIA Rd 10, approximately 7 miles east of Mandaree. Location information for the Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH facility is presented in Table 2. A site location map is included as Figure 1.

Table 2. Location Information

Well Name	County	Section Location	Latitude, Longitude	Elevation
Horse Camp 2-11H	Dunn	NWNW, S11, T149N, 93W	47.744995, -102.554261	2,290 feet
Horse Camp 101-11H	Dunn	NWNW, S11, T149N, 93W	47.745037, -102.55407	2,290 feet
Horse Camp West 2MBH	Dunn	NWNW, S11, T149N, 93W	47.745092, -102.553792	2,305 feet
Horse Camp West 2TFH	Dunn	NWNW, S11, T149N, 93W	47.745064, -102.553931	2,300 feet

Note: Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH are within the boundaries of the Fort Berthold Reservation in North Dakota.

Dunn County is designated by the EPA as being in attainment or unclassified with respect to the National Ambient Air Quality Standards (NAAQS) for ozone (O₃), carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), particulate matter less than 10 microns in diameter (PM₁₀), particulate matter less than 2.5 microns in diameter (PM_{2.5}), and lead (Pb). Thus, the Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH facility is not subject to nonattainment NSR.



Figure 1. General Location of the Facility

3 PROCESS DESCRIPTION

This section provides a detailed description of the processes and equipment installed at the Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH facility. Emission sources located at the facility include both point and fugitive sources. The facility consists of the following primary production equipment and air pollutant-emitting activities:

- Two (2) pumpjacks with a 75-horsepower (hp) electric engine;
- Two (2) two-phase separators each with a 1.0-million British thermal units per hour (MMBtu/hr) heater treater fueled by produced gas;
- Two (2) two-phase separators each with a 0.5-MMBtu/hr heater treater fueled by produced gas;
- Ten (10) 400-barrel crude oil/condensate storage tanks controlled by two flares with 98% or greater control efficiency;
- Six (6) 400-barrel produced water storage tanks controlled by two flares with 98% or greater control efficiency;
- One (1) 810-hp engine fueled by diesel;
- Truck loading of produced water; and
- Flaring of produced gas during upset conditions.

At the recently completed Horse Camp West 2MBH and 2TFH wells the produced fluids are flowing up the wellbore or are brought to the surface with the 810-hp engine powered by diesel. The two 75-hp electric engines help bring produced fluids to the surface at the Horse Camp 2-11H and 101-11H wells. The produced fluids from the wells are routed via a closed system to four separators with heater treaters. A combination of higher temperatures and lower pressures allows for the separation of the components comprising the fluid stream. The separator reduces the pressure and heats the fluid stream to a desired temperature range to aid in the separation of oil, natural gas, and produced water. This treatment removes impurities and separates the phases to best meet sales delivery specifications for oil. Two of the separation units are each heated by a 1.0 MMBtu/hr burner while the other two separation units are each heated by a 0.5 MMBtu/hr burner. The separation units' heater treater burners, when operating, are fueled by produced gas. The crude oil/condensate is temporarily stored in ten (10) 400-barrel storage tanks before being sold via pipeline. The produced water is stored in six (6) 400-barrel storage tanks prior to being transported offsite by truck. The produced gas is sold via a sales gas line except during upset conditions. Two Steffes-engineered flares control the emissions from the production tanks and the produced gas (with a control efficiency of 98% or greater).

4 EMISSION CALCULATION METHODOLOGY

Emissions were estimated based on estimated annual production totals and the daily averages for monthly production data for the Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH facility. The production data used in determining the facility emissions is presented in Table 3. Detailed production data is included in Appendix C.

Table 3. Well Production Data for Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Facility

Production Data for Estimating Basis	Days of Production	Total Oil, BBLs	Daily Oil Production Average, BOPD ^{1, 2}	Total Gas, MCF	Daily Gas Production Average, MCFD ^{1, 2}	Total Water, BBLs	Daily Water Production Average, BWPD ^{1, 2}
PTE	2-11H	2,755	91.82	2,113	70.45	2,132	71.06
	101-11H	2,062	68.73	1,849	61.63	1,889	62.96
	2MBH	38,220	409.50	30,002	321.45	35,454	379.86
	2TFH	11,002	129.44	10,982	129.20	35,008	411.86
	Combined	-	54,039	699.49	44,946	582.73	74,482
Estimated Actual Annual Emissions	2-11H	15,884	51.74	19,130	62.31	8,097	26.37
	101-11H	18,752	54.20	28,569	82.57	7,551	21.82
	2MBH	67,722	588.89	53,543	465.59	55,462	482.28
	2TFH	13,251	210.33	12,954	205.62	39,618	628.86
	Combined	-	115,609	905.16	114,196	816.09	110,728

¹ For PTE the daily production average assumes a 40% decline factor for the Horse Camp West 2MBH and 2TFH wells.

² The estimated actual annual emissions average daily production rate for the entire facility is based on the sum of the estimated actual daily production average for each well. The estimated actual daily production average was based on the first 4.5 months of actual production for the Horse Camp West 2MBH well, the first 3.5 months of actual production for the Horse Camp West 2TFH well, and the most recent operational 12 consecutive months' production data for the Horse Camp 2-11H and 101-11H wells.

Emissions were estimated based on EPA AP-42 emission factors, E&P TANK V2.0 and EPA Tanks 4.0.9d tank emission models, manufacturer specifications, and site-specific facility data. Estimating the PTE used assumptions that differ from the assumptions used when estimating the actual facility emissions. The methodology for each is detailed below.

4.1 Potential to Emit

In lieu of day-specific production data, the PTE was calculated based on the monthly production data for the Horse Camp West 2MBH and 2TFH wells for November and December 2018 and January 2019 (the first 56 days of production for the Horse Camp West 2MBH well and the first 51 days of production for the Horse Camp West 2TFH well) to estimate the average daily production of oil, water, and gas for each well in the first 56/51 days of production. An individual oil well usually produces at its maximum rate immediately following the first date of production and subsequently declines. A 40% decline factor was applied to the daily production average for the Horse Camp West 2MBH and 2TFH wells to account for this decline. Day-specific production data was available for the Horse Camp 2-11H and 101-11H wells and thus the PTE for these wells was based on the first 30 days of production starting on May 31, 2019. No decline factor was applied when calculating the daily production average for the Horse Camp 2-11H and 101-11H wells.

To estimate the emissions for a full year of operation, the daily production average for each well was assumed to be the production rate 365 days of the year. The production rates for each well were combined to estimate the production emissions for the entire facility with all four wells operating.

Approximately 48% of the gas produced by the Horse Camp West 2MBH and 2TFH wells from late November 2018 thru January 2019 was sold via pipeline. The rest of the produced gas was routed to the flares. Emissions from the storage tanks were also routed to the flares. It was assumed that 30% of the gas produced by the Horse Camp 2-11H and 101-11H wells is routed to the flares. The flares have a 98% control efficiency. The use of the flares as air pollution control equipment is accounted for in the PTE because it is legally and practically enforceable. All produced gas from production and storage operations that is not sold must be sent to an emission control device with at least a 98% control efficiency for VOCs per the Federal Implementation Plan for Oil and Natural Gas Well Production Facilities Fort Berthold Indian Reservation (40 CFR §49.4164).

4.2 Estimated Actual Annual Emissions

To estimate the actual annual emissions the actual daily production average for each well was multiplied by 365 days to get the total estimated annual production for the facility in a year. The actual daily production average was based on the production data for each well as follows:

- the first 4.5 months (end of November 2018 through March 2019) of production for the Horse Camp West 2MBH well;
- the first 3.5 months (end of November 2018 through February 2019 – the well did not operate in March 2019) of production for the Horse Camp West 2TFH well; and
- the most recent 12 consecutive months of operation for the Horse Camp 2-11H well (June 2017 thru May 2018) and the Horse Camp 101-11H well (January 2015 thru December 2015).

Approximately 75% of the gas produced by Horse Camp West 2MBH from late November 2018 thru March 2019 was sold via pipeline, the rest was sent to the flares. Approximately 20% of the gas produced by Horse Camp West 2TFH from late November 2019 thru February 2019 was sold via pipeline, the rest was sent to the flares (the well did not operate in March 2019). 48% of the gas produced by the Horse Camp 2-11H well from June 2017 thru May 2018 was sold via pipeline, 12% was sent to the flares, and approximately 40% of the produced gas was used onsite. Of all the gas produced by the Horse Camp 101-11H well in 2015, approximately 41% was sold via pipeline, 28% was flared, and 31% was used onsite as fuel. Emissions from the storage tanks were also routed to the flares.

4.3 Emission Units

The PTE and the estimated actual annual emissions for the Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH facility are estimated according to the following methodology for each emission unit type.

4.3.1 Crude Oil/Condensate Storage Tanks

To calculate the working, breathing, standing, and flashing losses from the ten (10) 400-barrel crude oil/condensate storage tanks, E&P TANK V2.0 was used. Inputs into the model include a representative oil and gas analysis and site-specific information. All tanks were modeled as one storage tank receiving all the produced oil from the well. The crude oil/condensate storage tank emissions are controlled by two

flares with a 98% destruction efficiency. Detailed inputs and outputs of the model are included in Appendix C.

4.3.2 Produced Water Tanks

To calculate the working, breathing, standing, and flashing losses from the six (6) 400-barrel produced water storage tanks, EPA Tanks 4.0.9d was used. Site-specific information was input into the model. One tank was modeled receiving one-sixth of all the produced water from the facility. The emissions from this tank were then multiplied by six. The produced water storage tank emissions are controlled by two flares with a 98% destruction efficiency. Detailed inputs and outputs of the model are included in Appendix C.

4.3.3 Truck Loading

Loading losses from produced water truck loading were calculated using *AP-42 Section 5.2 – Transportation And Marketing Of Petroleum Liquids*. Loading losses were calculated using the following equation:

$$L_L = 12.46 \frac{SPM}{(T + 460)}$$

Where L_L is the loading losses in pounds per 1,000 gallons of liquid loaded, S is the saturation factor for submerged loading (0.6), P is the true vapor pressure of the liquid loaded in psia (0.2 psia), M is the molecular weight of the vapors (20.7 lb/lb-mole), and T is the temperature of the bulk liquid loaded in degrees Fahrenheit (41.4 °F). All volatile organic compounds (VOCs) in the produced water are assumed to have been released to the atmosphere during truck loading.

4.3.4 Separators

There are four separators used onsite for separating the produced fluid stream into oil, natural gas, and produced water. The maximum fire box heat input rating for two of the separator heaters is 1,000,000 Btu/hr, each. The maximum fire box heat input rating for the remaining two separator heaters is 500,000 Btu/hr, each. The separator heaters are fueled by produced gas which has a gross heating value of 1,971.5 Btu/scf. Any excess produced gas not sold via gas sales line is flared. There are no supplemental fuel sources. Due to design operational limits, the separator burners must be functioning while the facility is in operation. Combustion emissions from the burner used to heat the fluid stream are vented to the atmosphere.

Emissions are calculated based on the assumption that the separators will operate 8,760 hours per year. PTE and estimated actual annual emissions are based on the maximum fuel consumption of the separator heaters. Particulate matter, NO_x, VOC, HAP, SO₂ and CO emissions have been calculated using emission factors obtained from *AP-42, Section 1.4 – Natural Gas Combustion, July 1998* for natural gas-fired external combustion sources. Appendix B includes detailed equations.

4.3.5 Fugitive Leaks

Fugitive emissions are calculated based on the number of sources of fugitive leaks (valves, pump seals, connectors, flanges, open-ended lines, etc.) and the composition of the flashed gas from the crude oil/condensate storage tanks as calculated by E&P TANK V2.0. The number of components at the site that could be sources of fugitive leaks was estimated was based on actual counts from a similar facility. Emission factors for the fugitive leaks were based on the *US EPA Protocol for Equipment Leak Emission*

Estimates (EPA-453/R-95-017) for light oil. The emission calculations for fugitive leaks are presented in Appendix B.

4.3.6 Flares

Emissions from the storage tanks are vented to two Steffes-engineered flares with a 98% control efficiency. Any produced gas not used for fueling the separators or the flare pilot lights that wasn't able to be sold via pipeline is also sent to the flare system. The pilot lights for the flares are fueled by produced gas which has a gross heating value of 1,971.5 Btu/scf. It is assumed that the pilot lights will burn continuously (8,760 hours per year) and that combustion emissions from each flare's pilot light are vented to the atmosphere.

Particulate matter, SO₂, and VOC emissions from the flare's pilot light have been calculated using emission factors obtained from *AP-42, Section 1.4 – Natural Gas Combustion*, July 1998 for natural gas-fired external combustion sources. NO_x and CO emission factors are from *AP-42 Section 13.5 – Industrial Flares* to provide a more conservative estimate than the emission factors for NO_x and CO contained in AP-42 Section 1.4. Appendix B includes detailed equations.

4.3.7 Engine

The Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH facility uses an 810-horsepower engine. The engine is fueled by diesel and is certified to meet the emission standards of and EPA-certified Tier 2 engine.

Emissions of CO, NO_x, VOC, and PM have been calculated based on the manufacturer's specifications. It was assumed that PM_{2.5} was equivalent to PM₁₀ which was assumed to be equivalent to PM. For SO₂, CO₂, and HAPs, emission factors for a diesel industrial engine from *AP-42, Section 3.3 – Gasoline and Diesel Industrial Engines* were used. CH₄ and N₂O emissions are calculated using emission factors provided from 40 CFR 98 Subpart C, Table C-2, for the combustion of diesel.

Potential emissions are calculated based on the assumption that the engine will operate 8,760 hours per year. Maximum hourly emissions are calculated by multiplying the nominal bhp by the appropriate emission factors. Appendix B provides the detailed emissions estimates with example calculations.

5 EMISSION SUMMARY

The PTE and the estimated actual annual emissions for the facility are presented below. Detailed emission calculations are provided in Appendix B.

5.1 Potential to Emit

The PTE calculated based on the first 56 days of production for the Horse Camp West 2MBH well, the first 51 days of production for the Horse Camp West 2TFH well, and the first 30 days of production since resuming operation for the Horse Camp 2-11H and 101-11H wells is presented in Table 4. The 40% decline factor was applied to the Horse Camp West 2MBH and 2TFH wells to better represent the production by the facility in the first year of operation, since an oil well usually produces at its maximum rate immediately following the first date of production and subsequently declines.

Table 4. Potential to Emit in Tons per Year

Emission Source Category	VOC	HAPs	NO _x	CO	SO ₂	PM ₁₀	H ₂ S
(4) 2-Phase Separators w/Heater Treaters	0.07	0.02	1.29	1.08	0.01	0.10	-
(10) Crude Oil/Condensate Storage Tanks	1.69	0.08	0.28	1.26	0.00	0.03	0.00
(6) Produced Water Storage Tanks	0.00	0.00	-	-	-	-	0.00
(2) Flare Pilots	0.00	0.00	0.01	0.06	0.00	< 0.01	-
Fugitive Leaks	5.54	0.30	-	-	-	-	0.00
Truck Loading	0.12	0.00	-	-	-	-	0.00
Engine	0.93	0.02	30.22	4.02	7.27	0.65	-
Produced Gas	46.05	2.64	5.65	25.75	0.05	0.62	0.00
Total PTE	54.41	3.06	37.44	32.17	7.33	1.40	0.00
Minor NSR Threshold	5	-	10	10	10	5	2
Above Minor NSR Threshold?	Yes	N/A	Yes	Yes	No	No	No
Title V Major Source Threshold	100	25	100	100	100	100	-
Above Title V Major Source Threshold?	No	No	No	No	No	No	N/A
Major NSR Threshold	250	-	250	250	250	250	-
Above Major NSR Threshold?	No	N/A	No	No	No	No	N/A

Note: PM_{2.5} is assumed to be equal to PM₁₀.

The PTE for the entire is below the major NSR threshold but above the minor NSR threshold for VOC, NO_x, and CO. The Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH facility must register with the EPA per the Federal Indian Country Minor NSR Rule.

5.2 Estimated Actual Annual Emissions

The estimated actual annual emissions for the facility based on the first 4.5 months of production data for the Horse Camp West 2MBH well, the first 3.5 months of production data for the Horse Camp West 2TFH well, and the most recent 12 consecutive months of operation for the Horse Camp 2-11H and 101-11H wells are presented in Table 5.

Table 5. Estimated Actual Annual Emissions in Tons per Year

Emission Source Category	VOC	HAPs	NO_x	CO	SO₂	PM₁₀	H₂S
(4) 2-Phase Separators w/Heater Treaters	0.07	0.02	1.29	1.08	0.01	0.10	-
(10) Crude Oil/Condensate Storage Tanks	2.19	0.10	0.36	1.63	< 0.01	0.04	0.00
(6) Produced Water Storage Tanks	< 0.01	< 0.01	-	-	-	-	0.00
(2) Flare Pilots	< 0.01	< 0.01	0.01	0.06	< 0.01	< 0.01	-
Fugitive Leaks	4.18	0.17	-	-	-	-	0.00
Truck Loading	0.31	0.01	-	-	-	-	0.00
Engine	0.93	0.02	30.22	4.02	7.27	0.65	-
Produced Gas	61.76	2.75	7.55	34.44	0.07	0.83	0.00
Total Actual Emissions	69.45	3.09	39.43	41.23	7.35	1.62	0.00
Minor NSR Threshold	5	-	10	10	10	5	2
Above Minor NSR Threshold?	Yes	N/A	Yes	Yes	No	No	No
Title V Major Source Threshold	100	25	100	100	100	100	-
Above Title V Major Source Threshold?	No	No	No	No	No	No	N/A
Major NSR Threshold	250	-	250	250	250	250	-
Above Major NSR Threshold?	No	N/A	No	No	No	No	N/A

Note: PM_{2.5} is assumed to be equal to PM₁₀.

The estimated actual annual emissions for the facility were greater than minor NSR thresholds (for VOC, NO_x, and CO) and, therefore, the facility must register with the EPA. The estimated actual annual emissions are less than major NSR thresholds and Title V major source thresholds.

6 FIP FOR OIL AND NATURAL GAS WELL PRODUCTION FACILITIES – FORT BERTHOLD INDIAN RESERVATION

The FIP is used instead of source-specific minor NSR preconstruction permits in Indian country. It incorporates emissions limits and other requirements from eight federal standards, applying limits for a range of equipment and processes used in oil and natural gas production and natural gas processing. Table 6 identifies those requirements and notes whether the requirement is applicable or not.

Table 6. Requirements Referenced in the FIP for True Minor Sources in Indian Country in the Oil and Natural Gas Industry Applicability Determination

Citation	Title	Potentially-Affected Facility Source(s)	Discussion	Applicability
40 CFR Part 60, Subpart OOOOa	Standards for New and Modified Sources in the Oil and Natural Gas Sector	The Facility: Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH, Storage Tanks, Fugitive Emissions, and Hydraulically-Fractured Oil and Gas Well Completions	The facility is a well-affected facility under this subpart and is subject to the subpart requirements. The well completions at the facility are subject to the requirements of this subpart. The produced water storage tanks are exempt from the requirements of this subpart because the PTE of the tanks is less than 1 tpy of VOC. The PTE of the crude oil/condensate storage tanks is 1.69 tpy (0.17 tpy per tank). Because the crude oil/condensate storage tanks have a PTE of less than 6 tpy per storage tank, they are exempt from the requirements of this subpart. Fugitive sources of emissions are subject to LDAR fugitive leak monitoring requirements amongst others.	Yes
40 CFR Part 60, Subpart Kb	Performance Standards for VOC Liquid Storage Tanks	Storage Tanks ($\geq 75 \text{ m}^3$)	All of the storage tanks at the facility are less than 75 m^3 (approx. 472 bbl). Therefore, the storage tanks are not subject to the requirements of this subpart.	No
40 CFR Part 60, Subpart IIII	Performance Standards for Stationary Compression Ignition Internal Combustion Engines	None	The facility commenced construction after July 11, 2005 and the engine was manufactured after April 1, 2006 and is subject to the subpart requirements. The engine has been certified by the manufacturer to meet the emission standards of this subpart for non-emergency engines.	Yes
40 CFR Part 60, Subpart JJJJ	Performance Standards for Stationary Spark Ignition Internal Combustion Engines	Engines	There are no stationary spark ignition internal combustion engines at the facility.	No
40 CFR Part 60, Subpart KKKK	Performance Standards for New Stationary Combustion Turbines	None	There are no stationary combustion turbines at the facility.	No
40 CFR Part 63, Subpart DDDDD	Air Toxics Standards for Industrial, Commercial, and Institutional Boilers and Process Heaters	Separator Heaters	The facility does not meet the subpart's definition of an affected source because it is not a major source of HAPs as defined in the subpart (the emissions from four wells at the facility are not to be combined when making the major source determination). Thus, the heaters are not subject to the requirements of this subpart.	No

Registration for Modification of an Existing True Minor Oil and Natural Gas Source in Indian Country Part 2
 Application for Horse Camp 2-11H & 101-11H and Horse Camp West 2MBH & 2TFH Oil and Gas Production Facility,
 Dunn County, North Dakota

Citation	Title	Potentially-Affected Facility Source(s)	Discussion	Applicability
40 CFR Part 63, Subpart HH	Air Toxics Standards for Oil and Natural Gas Production Facilities	The Facility: Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH	Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH well pad does not meet the definition of an affected facility under the referenced requirement because there are no tri-ethylene glycol dehydration units located at the facility. Therefore, the facility is not subject to the requirements of this subpart.	No
40 CFR Part 63, Subpart ZZZZ	Air Toxics Standards for Stationary Reciprocating Internal Combustion Engines	Engines	The stationary reciprocating internal combustion engine at the facility meets the requirements of subpart ZZZZ by meeting those of subpart IIII discussed above.	Yes

A summary of the requirements for the FIP for oil and gas well production facilities at Fort Berthold Indian Reservation is provided in Table 7.

Table 7. Review of FIP for Oil & Gas Facilities in Fort Berthold Reservation

Citation	Title	Applicability	Requirements	Compliance
40 CFR §49.4164	Construction and Operational Control Measures	Yes	Gas produced during well (re)completion must be routed to a control device with a destruction efficiency (DRE) of at least 90%.	PetroShale sends produced gas to a sales line except during upset conditions. The storage tank emissions are sent via a closed-vent system to the Steffes-engineered flares with a DRE of 98%.
			Any gas emissions due to production or storage operations must be routed to a control device with a DRE of at least 90%.	
40 CFR §49.4165	Control Equipment Requirements	Yes	Within 90 days from the first date of production, the facility must send the produced gas and any gas emissions from the storage tanks via a closed-vent system to either a gas sales line or to a control device with a DRE of at least 98%.	The covers on the storage tanks at the Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH facility will be impermeable and used as required. The closed vent system will be operated properly. The Steffes-engineered flares have all required features, will be operated per manufacturer specifications, and have a DRE of 98% as required.
			<p>Covers – every oil or water storage tank must have a cover that forms an impermeable barrier over the covered surface area. The cover should always be sealed shut except to add or remove material from the storage tank, inspect or sample the contained material, or for maintenance or inspections of equipment within the storage tank.</p> <p>Closed Vent Systems – closed vent systems must always be operated properly and operate without detecting gas emissions. If the system has a bypass device, the bypass device must either have a continuously-reading natural gas flow indicator with an alarm, or else use a lock and key configuration to secure the bypass valve at the inlet to the bypass device.</p> <p>Enclosed Combustors and Utility Flares – a flare must be operated per manufacturer specifications. The flare must be able to reduce gas VOC emissions by at least 98%. The flare must have a liquid knock-out system, a flash-back flame arrestor, either a continuously burning pilot flame with thermocouple or similar device, or an electronic automatic igniter, and a continuous monitoring system. The flare must be not be leaking or have any visible smoke emissions as determined by EPA Method 22. The flare must either:</p> <ul style="list-style-type: none"> a) have a diameter of 3” or greater, is non-assisted, has a hydrogen content of 8% by volume or more, and is designed and operated with an exit velocity less than 122 ft/s and less than V_{max}. or b) if the flare is unassisted, it must only be used with a net heating value for the combusted gas at 200 Btu/scf or greater; if the flare is steam- or air-assisted it must only be used when the net heating value of the combusted gas is 300 Btu/scf or greater and the maximum tip velocity (as determined in §60.18(c)(4)) <p><i>Pit Flares</i> – pit flares that have no visible emissions and have an automatic igniter may be operated to reduce natural gas VOCs by at least 90%. An operating manual must be written specifically for the pit flare and facility. The pit flare may only be used to:</p> <ul style="list-style-type: none"> a) control gas emissions during well (re)completion operations, or b) to control oil or water storage tank emissions provided that the total VOC for all storage tanks at the facility is less than 20 tons per 12-month period, or c) to control gas emissions that were diverted from pipeline injection to a backup control device temporarily (max. 500 hours). <p><i>Other Control Devices</i> – besides the control devices above, other control devices may be used with prior approval from the EPA as long as the device has a DRE of at least 98% for VOCs.</p>	

Citation	Title	Applicability	Requirements	Compliance
40 CFR §49.4166	Monitoring Requirements	Yes	<p>Oil and gas production facilities at Fort Berthold Reservation will monitor the following, if applicable:</p> <ul style="list-style-type: none"> • barrels of oil produced each time oil is unloaded from the storage tanks, • the operating hours of the pit flare, • the volume of produced natural gas sent to the enclosed combustor, utility flare, and/or pit flare, and • the volume of gas for all oil and produced water storage tanks that is sent to the enclosed combustor, utility flare, and/or pit flare. <p>The following require quarterly visual inspections that must be done while the storage tanks are filling:</p> <ol style="list-style-type: none"> 1) Tank hatches, covers, seals, pressure release valves, and closed vent systems. 2) Valves in the closed vent system and storage tank control system. <p>Enclosed combustors, utility flares, and pit flares:</p> <ul style="list-style-type: none"> • Must be physically inspected each time an operator is on site (minimum quarterly). • Must continuously monitor operational parameters that vary using malfunction alarms and remote notification systems where available. • Must monitor for visible smoke during operation each time an operator is on site (minimum quarterly). • Address any failures of the continuously burning pilot flame, automatic igniter, or improper operation of monitoring equipment. 	<p>PetroShale will monitor produced oil and volume of gas sent to flares.</p> <p>Quarterly visual inspections while the tanks are filling will be conducted as required.</p> <p>PetroShale will inspect and monitor the flares as required.</p>

Registration for Modification of an Existing True Minor Oil and Natural Gas Source in Indian Country Part 2 Application for Horse Camp 2-11H & 101-11H and Horse Camp West 2MBH & 2TFH Oil and Gas Production Facility, Dunn County, North Dakota

Citation	Title	Applicability	Requirements	Compliance
40 CFR §49.4167	Recordkeeping Requirements	Yes	<p>Below is a list of records the facility is required to keep:</p> <ul style="list-style-type: none"> Oil production (barrels); Produced gas volume sent to combustor; Volume of natural gas sent to the combustor from the storage tanks; Well (re)completion data, including the lat/lon of the well, the date, time, & duration (hours) of flowback from the well, the date, time, & duration (hours) of casinghead gas venting, and reasons for venting the gas instead of capturing or combusting; For each combustor/utility flare/pit flare record: operating manual, operation monitoring, deviation data (deviation operating time, date, time, length of time of deviation, corrective actions, preventative measures), records of missing pilot flame, malfunctioning automatic igniter, malfunctioning monitoring equipment, date & time of occurrence, action taken, preventative measures adopted; recording data device failure, time periods that saw visible smoke emissions from the combustor/utility flare, or pit flare; For the pit flare: a log of times pit flare was operational because gas that was to be injected into pipeline was diverted. The log must note date & time of flare start-up and shut-down, hours of operation due to infeasible pipeline injection from the previous 11 months thru now, and justification for each operation event; Records of closed-vent system bypass or shutdown, reason, duration, volume of gas released, action taken, and preventative measures adopted; and Produced water tanks and oil tanks inspection (as required by §49.4166) records, including date, findings, adjustments/repairs, name & signature of inspector. <p>The above records must be kept at the facility or at the location of that operates the facility on a daily basis. These records must be retained for 5 years from the date of record.</p>	PetroShale will keep the records required for each piece of applicable equipment.
40 CFR §49.4168	Notification and Reporting Requirements	Yes	<p>An annual report is due on 8/15 each year must cover all information for the previous year. The initial report must cover all information for that year.</p> <p>The annual report must contain: company name and address of oil and gas facility, identification of the production facility, reporting period beginning & ending dates, summary of all required records for each well (re)completion operation that occurred within the reporting period, first date of production for each well that began operating during the reporting period, summary of instances where well construction or operation was not in compliance with §49.4164, §49.4165, or §49.4166 for all wells at a facility, and certification of truth, accuracy, & completeness.</p>	PetroShale will submit the required annual report with all required data by 8/15 each year.

APPENDIX A

Registration for New True Minor Oil and Natural Gas Sources and Minor Modifications at Existing True Minor Oil and Natural Gas Sources Part 2 Form



United States Environmental Protection Agency

<https://www.epa.gov/tribal-air/tribal-minor-new-source-review>

January 4, 2017

**Part 2: Submit Within 60 Days After Startup
 of Production -- Emission and Production
 Information**

**FEDERAL IMPLEMENTATION PLAN FOR TRUE MINOR SOURCES IN INDIAN
 COUNTRY IN THE OIL AND NATURAL GAS PRODUCTION AND NATURAL
 GAS PROCESSING SEGMENTS OF THE OIL AND NATURAL GAS SECTOR
 Registration for New True Minor Oil and Natural Gas Sources and Minor
 Modifications at Existing True Minor Oil and Natural Gas Sources**

Please submit information to:

[Reviewing Authority] Air Program (Mail Code 8P-AR)
 Address US EPA Region 8
 1595 Wynkoop St.
 Phone] Denver, CO 80202

A. GENERAL SOURCE INFORMATION (See Instructions Below)

1. Company Name Petroshale (US), Inc.		2. Source Name Horse Camp 2-11H & 101-11H and Horse Camp West 2MBH & 2TFH 4-Well Pad Oil & Gas Production Facility	
3. Type of Oil and Natural Gas Operation Crude petroleum and natural gas extraction		4. New Minor Source? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
		5. True Source Modification? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
6. NAICS Code 211111		7. SIC Code 1311	
8. U.S. Well ID(s) or API Number(s) [if applicable] 33-025-01237, 33-025-01236, 33-025-03507, 33-025-03508			
9. Area of Indian Country Fort Berthold	10. County Dunn	11a. Latitude 47.744995	11b. Longitude -102.554261
		47.745037	-102.55407 101-11H
		47.745092	-102.553792 2MBH
		47.745064	-102.553931 2TFH

B. CONTACT INFORMATION (See Instructions Below)

1. Owner Name Petroshale (US), Inc. - Dominic Pallone		Title Vice President	
Mailing Address 303 East 17th Avenue, Suite 940 Denver, CO 80203			
Email Address dominic@petroshaleinc.com			
Telephone Number (720) 343-8648		Facsimile Number (303) 484-3255	
2. Operator Name (if different from owner) N/A		Title Same as Owner	
Mailing Address			
Email Address			
Telephone Number		Facsimile Number	
3. Source Contact Dominic Pallone		Title Vice President	
Mailing Address 303 East 17th Avenue, Suite 940 Denver, CO 80203			
Email Address dominic@petroshaleinc.com			
Telephone Number (720) 343-8648		Facsimile Number (303) 484-3255	

4. Compliance Contact		Title
Same as Source Contact		
Mailing Address		
Same as Source Contact		
Email Address		
Same as Source Contact		
Telephone Number	Facsimile Number	
Same as Source Contact		

C. EMISSIONS AND OTHER SOURCE INFORMATION

Include all of the following information in the table below and as attachments to this form:

Note: The emission estimates can be based upon actual test data or, in the absence of such data, upon procedures acceptable to the Reviewing Authority. The following procedures are generally acceptable for estimating emissions from air pollution sources: (1) unit-specific emission tests; (2) mass balance calculations; (3) published, verifiable emission factors that are applicable to the unit (i.e., manufacturer specifications); (4) other engineering calculations; or (5) other procedures to estimate emissions specifically approved by the Reviewing Authority. Guidance for estimating emissions can be found at <https://www.epa.gov/chief>.

- Narrative description of the operations.
- Identification and description of any air pollution control equipment and compliance monitoring devices or activities.
- Type and actual amount (annually) of each fuel that will be used.
- Type of raw materials used (e.g., water for hydraulic fracturing).
- Actual, annual production rates.
- Actual operating schedules.
- Any existing limitations on source operations affecting emissions or any work practice standards, where applicable, for all regulated New Source Review (NSR) pollutants at your source. Indicate all requirements referenced in the Federal Implementation Plan (FIP) for True Minor Sources in Indian Country in the Oil and Natural Gas Production and Natural Gas Processing Segments of the Oil and Natural Gas Sector that apply to emissions units and air pollution generating activities at the source or proposed. Include statements indicating each emissions unit that is an emissions unit potentially subject to the requirements referenced in the FIP, but does not meet the definition of an affected facility under the referenced requirement, and therefore, is not subject to those requirements.
- For each emissions unit comprising the new source or modification, estimates of the total allowable (potential to emit) annual emissions at startup of production from the air pollution source for the following air pollutants: particulate matter, PM₁₀, PM_{2.5}, sulfur oxides (), nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compound (VOC), lead (Pb) and lead compounds, fluorides (gaseous and particulate), sulfuric acid mist (H₂SO₄), hydrogen sulfide (H₂S), total reduced sulfur (TRS) and reduced sulfur compounds, including all calculations for the estimates. Allowable annual emissions are defined as: emissions rate of an emissions unit calculated using the maximum capacity of a stationary source to emit a pollutant under its physical and operational design. Any physical

or operational limitation on the capacity of the source to emit a pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design if the limitation, or the effect it would have on emissions, is legally and practically enforceable. You must determine the potential for emissions within 30 days from the startup of production.

- For each emissions unit comprising the new source or modification, estimates of the total actual annual emissions during the upcoming, consecutive 12 months from the air pollution source for the following air pollutants: particulate matter (PM, PM₁₀, PM_{2.5}), sulfur oxides (SO_x), nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compound (VOC), lead (Pb) and lead compounds, ammonia (NH₃), fluorides (gaseous and particulate), sulfuric acid mist (H₂SO₄), hydrogen sulfide (H₂S), total reduced sulfur (TRS) and reduced sulfur compounds, including all calculations for the estimates. Estimates of actual emissions must take into account equipment, operating conditions, and air pollution control measures. You should calculate an estimate of the actual annual emissions using estimated operating hours, production rates, in-place control equipment, and types of materials processed, stored, or combusted.

D. TABLE OF ESTIMATED EMISSIONS

Provide in the table below estimates of the total allowable annual emissions in tons per year (tpy) and total actual annual emissions (tpy) for the following pollutants for all emissions units comprising the new source or modification.

POLLUTANT	TOTAL ALLOWABLE ANNUAL EMISSIONS (TPY)	TOTAL ACTUAL ANNUAL EMISSIONS (TPY)
PM	1.40	1.62
PM ₁₀	1.40	1.62
PM _{2.5}	1.40	1.62
SO _x	7.33	7.35
NO _x	37.44	39.43
CO	32.17	41.23
VOC	54.41	69.45
Pb	0.00	0.00

POLLUTANT	TOTAL ALLOWABLE ANNUAL EMISSIONS (TPY)	TOTAL ACTUAL ANNUAL EMISSIONS (TPY)
NH3	0.00	0.00
Fluorides		
H ₂ SO ₄	0.00	0.00
H ₂ S	0.00	0.00
TRS	0.00	0.00

APPENDIX B
Emission Calculations

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH
Production Facility
PTE Emission Calculations
Emission Sources

Table B.1. - Emission Sources

Emission Unit	Quantity	Rating/Capacity
2-Phase Separators w/Heater Treater	2	1.0 MMBtu/hr each
2-Phase Separators w/Heater Treater	2	0.5 MMBtu/hr each
Crude Oil/Condensate Storage Tanks	10	400 BBL each
Produced Water Storage Tanks	6	400 BBL each
Flares	2	21.45 scf/hr pilot rating
Fugitive Leaks	-	-
Truck Loading	-	N/A
Generator Engine	1	810 horsepower
Produced Gas	-	-

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
PTE Emission Calculations
Emissions Summaries

Table B.2. - Summary of Uncontrolled Emissions in Pounds per Hour

Emission Source	VOC	HAPs	NO _x	CO	SO ₂	H ₂ S	PM ₁₀	PM _{2.5}	CO _{2e}
2-Phase Separators w/Heater Treater	0.02	0.01	0.29	0.25	0.00	-	0.02	0.02	351.29
(10) Crude Oil/Condensate Storage Tanks	19.08	0.79	-	-	-	0.00	-	-	407.56
(6) Produced Water Storage Tanks	0.04	0.00	-	-	-	0.00	-	-	0.41
(2) Flares Pilots	-	-	-	-	-	-	-	-	-
Fugitive Leaks	1.26	0.07	-	-	-	0.00	-	-	4.80
Truck Loading	0.13	0.00	-	-	-	0.00	-	-	7.85
(1) Generator Engine	0.64	0.01	7.88	4.66	1.66	-	0.27	0.27	934.30
Produced Gas	520.54	28.33	-	-	-	0.00	-	-	3,855.37
Total	541.71	29.20	8.17	4.91	1.66	0.00	0.29	0.29	5,561.58

Table B.3. - Summary of Uncontrolled Emissions in Tons Per Year

Emission Source	VOC	HAPs	NO _x	CO	SO ₂	H ₂ S	PM ₁₀	PM _{2.5}	CO _{2e}
2-Phase Separators w/Heater Treater	0.07	0.02	0.29	0.25	0.00	-	0.10	0.10	1,538.67
(10) Crude Oil/Condensate Storage Tanks	83.57	3.45	-	-	-	0.00	-	-	1,785.11
(6) Produced Water Storage Tanks	0.16	0.00	-	-	-	0.00	-	-	1.81
(2) Flares Pilots	-	-	-	-	-	-	-	-	-
Fugitive Leaks	5.54	0.30	-	-	-	0.00	-	-	21.02
Truck Loading	0.12	0.00	-	-	-	0.00	-	-	7.37
(1) Generator Engine	2.82	0.03	34.51	20.41	7.27	-	1.17	1.17	4,092.23
Produced Gas	2,279.97	124.10	-	-	-	0.00	-	-	16,886.53
Total	2,372.25	127.91	34.80	20.66	7.27	0.00	1.26	1.26	24,332.73

Table B.4. - Summary of Controlled Emissions in Pounds per Hour

Emission Source	VOC	HAPs	NO _x	CO	SO ₂	H ₂ S	PM ₁₀	PM _{2.5}	CO _{2e}
2-Phase Separators w/Heater Treater	0.02	0.01	0.29	0.25	0.00	-	0.02	0.02	351.29
(10) Crude Oil/Condensate Storage Tanks	0.39	0.02	0.06	0.29	0.00	0.00	0.01	0.01	117.74
(6) Produced Water Storage Tanks	0.00	0.00	-	-	-	0.00	-	-	0.06
(2) Flares Pilots	0.00	0.00	0.00	0.01	0.00	-	0.00	0.00	5.08
Fugitive Leaks	1.26	0.07	-	-	-	0.00	-	-	4.80
Truck Loading	0.13	0.00	-	-	-	0.00	-	-	7.85
(1) Generator Engine	0.21	0.00	6.90	0.92	1.66	-	0.15	0.15	934.30
Produced Gas	10.51	0.60	1.29	5.88	0.01	0.00	0.14	0.14	2,303.30
Total	12.53	0.70	8.55	7.35	1.67	0.00	0.32	0.32	3,724.42

Table B.5. - Summary of Controlled Emissions in Tons Per Year

Emission Source	VOC	HAPs	NO _x	CO	SO ₂	H ₂ S	PM ₁₀	PM _{2.5}	CO _{2e}
2-Phase Separators w/Heater Treater	0.07	0.02	1.29	1.08	0.01	-	0.10	0.10	1,538.67
(10) Crude Oil/Condensate Storage Tanks	1.69	0.08	0.28	1.26	0.00	0.00	0.03	0.03	515.69
(6) Produced Water Storage Tanks	0.00	0.00	-	-	-	0.00	-	-	0.28
(2) Flares Pilots	0.00	0.00	0.01	0.06	0.00	-	0.00	0.00	22.24
Fugitive Leaks	5.54	0.30	-	-	-	0.00	-	-	21.02
Truck Loading	0.12	0.00	-	-	-	0.00	-	-	7.37
(1) Generator Engine	0.93	0.02	30.22	4.02	7.27	-	0.65	0.65	4,092.23
Produced Gas	46.05	2.64	5.65	25.75	0.05	0.00	0.62	0.62	10,088.47
Total	54.41	3.06	37.44	32.17	7.33	0.00	1.40	1.40	16,285.97

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
PTE Emission Calculations
HAPs Emissions Summaries

Table B.6. - Summary of Uncontrolled HAP Emissions in Pounds per Hour

Hazardous Air Pollutant	Separators	Condensate Tanks	Produced Water Tanks	Flare Pilots	Fugitive Leaks	Truck Loading	Produced Gas	Generator Engine	Total
1,3-Butadiene	-	-	-	-	-	-	-	6.2E-05	6.2E-05
2-Methylnaphthalene	7.1E-08	-	-	-	-	-	-	-	7.1E-08
2,2,4-Trimethylpentane	-	0.00	0.00	-	0.00	0.00	0.00	0.0E+00	0.0E+00
3-Methylchloranthrene	5.3E-09	-	-	-	-	-	-	-	5.3E-09
7,12-Dimethylbenz(a)anthracene	4.7E-08	-	-	-	-	-	-	-	4.7E-08
Acenaphthene	5.3E-09	-	-	-	-	-	-	2.2E-06	2.2E-06
Acenaphthylene	-	-	-	-	-	-	-	8.0E-06	8.0E-06
Acetaldehyde	-	-	-	-	-	-	-	1.2E-03	1.2E-03
Acrolein	-	-	-	-	-	-	-	1.5E-04	1.5E-04
Anthracene	7.1E-09	-	-	-	-	-	-	3.0E-06	3.0E-06
Benzene	6.2E-06	0.08	7.2E-05	-	5.6E-03	4.0E-04	2.32	1.5E-03	2.41
Benzo(a)anthracene	5.3E-09	-	-	-	-	-	-	2.7E-06	2.7E-06
Benzo(a)pyrene	3.5E-09	-	-	-	-	-	-	3.0E-07	3.0E-07
Benzo(b)fluoranthene	5.3E-09	-	-	-	-	-	-	1.6E-07	1.6E-07
Benzo(k)fluoranthene	5.3E-09	-	-	-	-	-	-	2.4E-07	2.5E-07
Benzo(g,h,i)perylene	3.5E-09	-	-	-	-	-	-	-	3.5E-09
Benzo(g,h,l)perylene	-	-	-	-	-	-	-	7.7E-07	7.7E-07
Chrysene	5.3E-09	-	-	-	-	-	-	5.6E-07	5.6E-07
Dibenz(a,h)anthracene	3.5E-09	-	-	-	-	-	-	9.2E-07	9.2E-07
Dichlorobenzene	3.5E-06	-	-	-	-	-	-	-	3.5E-06
Ethylbenzene	-	2.3E-03	2.0E-06	-	1.3E-03	8.5E-06	0.54	0.0E+00	0.55
Fluoranthene	8.8E-09	-	-	-	-	-	-	1.2E-05	1.2E-05
Fluorene	8.2E-09	-	-	-	-	-	-	4.6E-05	4.6E-05
Formaldehyde	2.2E-04	-	-	-	-	-	-	1.86E-03	2.08E-03
n-Hexane	5.3E-03	0.62	5.4E-04	-	0.04	0.00	14.64	0.0E+00	15.30
Indeno(1,2,3-cd)pyrene	5.3E-09	-	-	-	-	-	-	5.9E-07	6.0E-07
Naphthalene	1.8E-06	-	-	-	-	-	-	1.3E-04	1.4E-04
Phenanthrene	5.0E-08	-	-	-	-	-	-	4.6E-05	4.6E-05
Phenol	-	-	-	-	-	-	-	0.0E+00	0.0E+00
Pyrene	1.5E-08	-	-	-	-	-	-	7.6E-06	7.6E-06
Toluene	1.0E-05	0.07	6.0E-05	-	1.4E-02	2.9E-04	5.95	6.5E-04	6.04
Xylene	-	0.02	1.6E-05	-	1.2E-02	6.6E-05	4.88	4.5E-04	4.91
Total	5.54E-03	0.79	6.88E-04	0.00	0.07	0.00	28.33	6.12E-03	29.21

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
PTE Emission Calculations
HAPs Emissions Summaries

Table B.7. - Summary of Controlled HAP Emissions in Pounds per Hour

Hazardous Air Pollutant	Separator	Condensate Tanks	Produced Water Tanks	Flare Pilot	Fugitive Leaks	Truck Loading	Produced Gas	Generator Engine	Total
1,3-Butadiene	-	-	-	-	-	-	-	2.0E-05	2.0E-05
2-Methylnaphthalene	7.1E-08	-	-	1.0E-09	-	-	-	-	7.2E-08
2,2,4-Trimethylpentane	-	0.00	0.00	-	0.00	0.00	0.00	0.0E+00	0.00
3-Methylchloranthrene	5.3E-09	-	-	7.7E-11	-	-	-	-	5.4E-09
7,12-Dimethylbenz(a)anthracene	4.7E-08	-	-	6.8E-10	-	-	-	-	4.8E-08
Acenaphthene	5.3E-09	-	-	7.7E-11	-	-	-	7.4E-07	7.5E-07
Acenaphthylene	-	-	-	-	-	-	-	2.6E-06	2.6E-06
Acetaldehyde	-	-	-	-	-	-	-	4.0E-04	4.0E-04
Acrolein	-	-	-	-	-	-	-	4.8E-05	4.8E-05
Anthracene	7.1E-09	-	-	1.0E-10	-	-	-	9.8E-07	9.9E-07
Benzene	6.2E-06	1.7E-03	1.4E-06	8.9E-08	5.6E-03	4.0E-04	0.05	4.9E-04	0.05
Benzo(a)anthracene	5.3E-09	-	-	7.7E-11	-	-	-	8.8E-07	8.8E-07
Benzo(b)fluoranthene	5.3E-09	-	-	7.7E-11	-	-	-	5.2E-08	5.7E-08
Benzo(k)fluoranthene	5.3E-09	-	-	7.7E-11	-	-	-	8.1E-08	8.7E-08
Benzo(a)pyrene	3.5E-09	-	-	5.1E-11	-	-	-	9.8E-08	1.0E-07
Benzo(g,h,l)perylene	3.5E-09	-	-	5.1E-11	-	-	-	2.6E-07	2.6E-07
Chrysene	5.3E-09	-	-	7.7E-11	-	-	-	1.8E-07	1.9E-07
Dibenz(a,h)anthracene	3.5E-09	-	-	5.1E-11	-	-	-	3.1E-07	3.1E-07
Dichlorobenzene	3.5E-06	-	-	5.1E-08	-	-	-	-	3.6E-06
Ethylbenzene	-	4.6E-05	4.0E-08	-	1.3E-03	8.5E-06	1.1E-02	0.0E+00	1.2E-02
Fluoranthene	8.8E-09	-	-	1.3E-10	-	-	-	4.0E-06	4.0E-06
Fluorene	8.2E-09	-	-	1.2E-10	-	-	-	1.5E-05	1.5E-05
Formaldehyde	2.2E-04	-	-	3.2E-06	-	-	-	6.17E-04	8.41E-04
n-Hexane	5.3E-03	0.01	1.1E-05	7.7E-05	0.04	0.00	0.33	0.0E+00	0.38
Indeno(1,2,3-cd)pyrene	5.3E-09	-	-	7.7E-11	-	-	-	2.0E-07	2.0E-07
Naphthalene	1.8E-06	-	-	2.6E-08	-	-	-	4.4E-05	4.6E-05
Phenanthrene	5.0E-08	-	-	7.2E-10	-	-	-	1.5E-05	1.5E-05
Pyrene	1.5E-08	-	-	2.1E-10	-	-	-	2.5E-06	2.5E-06
Toluene	1.0E-05	1.4E-03	1.2E-06	1.4E-07	1.4E-02	2.9E-04	0.12	2.1E-04	0.14
Xylene	-	3.7E-04	3.3E-07	-	1.2E-02	6.6E-05	0.10	1.5E-04	0.11
Total	5.54E-03	0.02	1.38E-05	8.00E-05	0.07	0.00	0.60	2.03E-03	0.70

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
PTE Emission Calculations
HAPs Emissions Summaries

Table B.8. - Summary of Uncontrolled HAP Emissions in Tons per Year

Hazardous Air Pollutant	Separator	Condensate Tanks	Produced Water Tanks	Flare Pilot	Fugitive Leaks	Truck Loading	Produced Gas	Generator Engine	Total
1,3-Butadiene	-	-	-	-	-	-	-	2.7E-04	2.7E-04
2-Methylnaphthalene	3.1E-07	-	-	-	-	-	-	-	3.1E-07
2,2,4-Trimethylpentane	-	0.00	0.00	-	0.00	0.00	0.00	0.0E+00	0.0E+00
3-Methylchloranthrene	2.3E-08	-	-	-	-	-	-	-	2.3E-08
7,12-Dimethylbenz(a)anthracene	2.1E-07	-	-	-	-	-	-	-	2.1E-07
Acenaphthene	2.3E-08	-	-	-	-	-	-	9.8E-06	9.8E-06
Acenaphthylene	-	-	-	-	-	-	-	3.5E-05	3.5E-05
Acetaldehyde	-	-	-	-	-	-	-	0.01	0.01
Acrolein	-	-	-	-	-	-	-	6.4E-04	6.4E-04
Anthracene	3.1E-08	-	-	-	-	-	-	1.3E-05	1.3E-05
Benzene	2.7E-05	0.36	3.2E-04	-	2.5E-02	3.8E-04	10.15	6.5E-03	10.54
Benzo(a)anthracene	2.3E-08	-	-	-	-	-	-	1.2E-05	1.2E-05
Benzo(b)fluoranthene	2.3E-08	-	-	-	-	-	-	6.9E-07	7.1E-07
Benzo(k)fluoranthene	2.3E-08	-	-	-	-	-	-	1.1E-06	1.1E-06
Benzo(a)pyrene	1.5E-08	-	-	-	-	-	-	1.3E-06	1.3E-06
Benzo(g,h,l)perylene	1.5E-08	-	-	-	-	-	-	3.4E-06	3.4E-06
Chrysene	2.3E-08	-	-	-	-	-	-	2.4E-06	2.5E-06
Dibenz(a,h)anthracene	1.5E-08	-	-	-	-	-	-	4.0E-06	4.0E-06
Dichlorobenzene	1.5E-05	-	-	-	-	-	-	-	1.5E-05
Ethylbenzene	-	1.0E-02	8.7E-06	-	5.8E-03	8.0E-06	2.37	0.0E+00	2.39
Fluoranthene	3.9E-08	-	-	-	-	-	-	5.3E-05	5.3E-05
Fluorene	3.6E-08	-	-	-	-	-	-	2.0E-04	2.0E-04
Formaldehyde	9.7E-04	-	-	-	-	-	-	8.16E-03	9.13E-03
n-Hexane	0.02	2.70	2.4E-03	-	0.16	0.00	64.14	0.0E+00	67.02
Indeno(1,2,3-cd)pyrene	2.3E-08	-	-	-	-	-	-	2.6E-06	2.6E-06
Naphthalene	7.9E-06	-	-	-	-	-	-	5.9E-04	5.9E-04
Phenanthrene	2.2E-07	-	-	-	-	-	-	2.0E-04	2.0E-04
Pyrene	6.4E-08	-	-	-	-	-	-	3.3E-05	3.3E-05
Toluene	4.4E-05	0.30	2.6E-04	-	6.3E-02	2.7E-04	26.07	2.8E-03	26.44
Xylene	-	0.08	7.1E-05	-	5.2E-02	6.2E-05	21.36	2.0E-03	21.50
Total	0.02	3.45	3.01E-03	0.00	0.30	0.00	124.10	2.68E-02	127.91

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
PTE Emission Calculations
HAPs Emissions Summaries

Table B.9. - Summary of Controlled HAP Emissions in Tons per Year

Hazardous Air Pollutant	Separator	Condensate Tanks	Produced Water Tanks	Flare Pilot	Fugitive Leaks	Truck Loading	Produced Gas	Generator Engine	Total
1,3-Butadiene	-	-	-	-	-	-	-	9.0E-05	9.0E-05
2-Methylnaphthalene	3.1E-07	-	-	4.5E-09	-	-	-	-	3.1E-07
2,2,4-Trimethylpentane	-	0.00	0.00	-	0.00	0.00	0.00	0.0E+00	0.0E+00
3-Methylchloranthrene	2.3E-08	-	-	3.4E-10	-	-	-	-	2.4E-08
7,12-Dimethylbenz(a)anthracene	2.1E-07	-	-	3.0E-09	-	-	-	-	2.1E-07
Acenaphthene	2.3E-08	-	-	3.4E-10	-	-	-	3.3E-06	3.3E-06
Acenaphthylene	-	-	-	-	-	-	-	1.2E-05	1.2E-05
Acetaldehyde	-	-	-	-	-	-	-	1.76E-03	1.76E-03
Acrolein	-	-	-	-	-	-	-	2.1E-04	2.1E-04
Anthracene	3.1E-08	-	-	4.5E-10	-	-	-	4.3E-06	4.3E-06
Benzene	2.7E-05	7.2E-03	6.3E-06	3.9E-07	2.5E-02	3.8E-04	0.20	2.1E-03	0.24
Benzo(a)anthracene	2.3E-08	-	-	3.4E-10	-	-	-	3.9E-06	3.9E-06
Benzo(b)fluoranthene	2.3E-08	-	-	3.4E-10	-	-	-	2.3E-07	2.5E-07
Benzo(k)fluoranthene	2.3E-08	-	-	3.4E-10	-	-	-	3.6E-07	3.8E-07
Benzo(a)pyrene	1.5E-08	-	-	2.2E-10	-	-	-	4.3E-07	4.5E-07
Benzo(g,h,l)perylene	1.5E-08	-	-	2.2E-10	-	-	-	1.1E-06	1.1E-06
Chrysene	2.3E-08	-	-	3.4E-10	-	-	-	8.1E-07	8.3E-07
Dibenz(a,h)anthracene	1.5E-08	-	-	2.2E-10	-	-	-	1.3E-06	1.4E-06
Dichlorobenzene	1.5E-05	-	-	2.2E-07	-	-	-	-	1.6E-05
Ethylbenzene	-	2.0E-04	1.7E-07	-	5.8E-03	8.0E-06	4.7E-02	0.0E+00	5.3E-02
Fluoranthene	3.9E-08	-	-	5.6E-10	-	-	-	1.7E-05	1.7E-05
Fluorene	3.6E-08	-	-	5.2E-10	-	-	-	6.7E-05	6.7E-05
Formaldehyde	9.7E-04	-	-	1.4E-05	-	-	-	2.70E-03	3.68E-03
n-Hexane	0.02	0.06	4.7E-05	3.4E-04	0.16	0.00	1.43	0.0E+00	1.67
Indeno(1,2,3-cd)pyrene	2.3E-08	-	-	3.4E-10	-	-	-	8.6E-07	8.8E-07
Naphthalene	7.9E-06	-	-	1.1E-07	-	-	-	1.9E-04	2.0E-04
Phenanthrene	2.2E-07	-	-	3.2E-09	-	-	-	6.7E-05	6.8E-05
Pyrene	6.4E-08	-	-	9.3E-10	-	-	-	1.1E-05	1.1E-05
Toluene	4.4E-05	6.1E-03	5.3E-06	6.3E-07	6.3E-02	2.7E-04	0.52	9.4E-04	0.59
Xylene	-	1.6E-03	1.4E-06	-	5.2E-02	6.2E-05	0.43	6.5E-04	0.48
Total	0.02	0.08	6.03E-05	3.51E-04	0.30	0.00	2.63	8.88E-03	3.04

Petroshale (US), Inc.

Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility

**PTE Emission Calculations
First Month's Production Data**

Table B.10.a - Horse Camp West 2MBH First 56 Days Production Data

Month	Days On	Oil Produced, BBLs	Water Produced, BBLs	Gas Produced, MSCF	Gas Flared, MCF
November 2018	8	6,120	8,080	4,637	4,637
December 2018	17	14,341	13,034	13,152	2,695
January 2019	31	17,759	14,340	12,213	1,347
Daily Average		682.50	633.11	535.75	154.98
Adjusted Daily Average ¹		409.50	379.86	321.45	92.99

Note: Due to availability of monthly data in lieu of daily data the daily production average is based on the first 56 days of production.

¹ Assuming a 40% decline in production for the first year of operation.

Table B.10.b - Horse Camp West 2TFH First 51 Days Production Data

Month	Days On	Oil Produced, BBLs	Water Produced, BBLs	Gas Produced, MSCF	Gas Flared, MCF
November 2018	7	840	4,464	652	652
December 2018	13	2,867	10,368	1,127	937
January 2019	31	7,295	20,176	9,203	6,765
Daily Average		215.73	686.43	215.33	163.80
Adjusted Daily Average ¹		129.44	411.86	129.20	98.28

Note: Due to availability of monthly data in lieu of daily data the daily production average is based on the first 51 days of production.

¹ Assuming a 40% decline in production for the first year of operation.

Table B.10.c - Horse Camp 2-11H Production Data

Date	Day	Oil Produced, BBLs	Water Produced, BBLs	Gas Produced, MSCF	Gas Flared, MCF
5/31/2019	1	17	33	0	0
6/1/2019	2	109	218	4	1
6/2/2019	3	75	252	86	26
6/3/2019	4	77	60	97	29
6/4/2019	5	0	0	0	0
6/5/2019	6	47	55	59	18
6/6/2019	7	70	92	87	26
6/7/2019	8	114	47	110	33
6/8/2019	9	107	62	128	38
6/9/2019	10	131	57	140	42
6/10/2019	11	79	72	104	31
6/11/2019	12	96	73	82	25
6/12/2019	13	84	65	75	22
6/13/2019	14	102	63	79	24
6/14/2019	15	93	70	114	34
6/15/2019	16	94	65	61	18
6/16/2019	17	111	63	66	20
6/17/2019	18	103	60	83	25
6/18/2019	19	101	73	75	22
6/19/2019	20	109	63	69	21
6/20/2019	21	100	65	53	16
6/21/2019	22	109	60	73	22
6/22/2019	23	102	62	60	18
6/23/2019	24	98	65	58	17
6/24/2019	25	106	60	57	17
6/25/2019	26	106	60	61	18
6/26/2019	27	111	58	68	20
6/27/2019	28	102	58	55	16
6/28/2019	29	109	55	61	18
6/29/2019	30	95	45	52	16
Daily Average		91.82	71.06	70.45	21.13

Note: Assumed 30% of produced gas would be sent to the flare.

Table B.10.d - Horse Camp 101-11H Production Data

Date	Day	Oil Produced, BBLs	Water Produced, BBLs	Gas Produced, MSCF	Gas Flared, MCF
5/31/2019	1	3	322	0	0
6/1/2019	2	44	85	24	7
6/2/2019	3	74	70	84	25
6/3/2019	4	79	58	99	30
6/4/2019	5	54	42	196	59
6/5/2019	6	67	52	84	25
6/6/2019	7	79	43	98	29
6/7/2019	8	71	80	68	20
6/8/2019	9	80	55	96	29
6/9/2019	10	57	62	61	18
6/10/2019	11	80	50	106	32
6/11/2019	12	74	55	63	19
6/12/2019	13	71	53	63	19
6/13/2019	14	79	72	61	18
6/14/2019	15	70	48	86	26
6/15/2019	16	80	57	52	16
6/16/2019	17	74	48	44	13
6/17/2019	18	74	48	59	18
6/18/2019	19	81	57	60	18
6/19/2019	20	65	52	41	12
6/20/2019	21	76	35	40	12
6/21/2019	22	57	53	38	11
6/22/2019	23	70	43	41	12
6/23/2019	24	72	48	43	13
6/24/2019	25	74	47	40	12
6/25/2019	26	55	37	32	10
6/26/2019	27	70	52	43	13
6/27/2019	28	79	45	42	13
6/28/2019	29	67	53	37	11
6/29/2019	30	85	67	46	14
Daily Average		68.73	62.96	61.63	18.49

Note: Assumed 30% of produced gas would be sent to the flare.

Table B.10.e - Daily Average Production of the Entire Facility (all 4 wells)

Well	Oil Produced Per Day, BBLs	Water Produced Per Day, BBLs	Gas Produced Per Day, MSCF	Gas Flared Per Day, MCF
Horse Camp 2-11H	91.82	71.06	70.45	21.13
Horse Camp 101-11H	68.73	62.96	61.63	18.49
Horse Camp West 2MBH ¹	409.50	379.86	321.45	92.99
Horse Camp West 2TFH ¹	129.44	411.86	129.20	98.28
Total Facility Daily Average	699.49	925.73	582.73	230.90

¹ Assuming a 40% decline in production for the first year of operation.

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
PTE Emission Calculations
Separator Burners

Table B.11. - Separator Burner Information

Parameter	Value
Burner Rating (each), MMBtu/hr	1.00
Number of Separator Burners	2
Burner Rating (each), MMBtu/hr	0.50
Number of Separator Burners	2
HHV, Btu/scf	1,971.51
Total Fuel Consumption, Mscf/day	36.52

Note: Fuel HHV from weighted average of Horse Camp 4-11H and Horse Camp 104-11H gas analyses dated March 23, 2018. Fuel consumption calculated using:

$$\frac{Mscf}{day} = \left[\text{Burner rating, } \frac{MMBtu}{hr} \right] \times \left[\frac{10^6 Btu}{MMBtu} \right] \times \left[\frac{24hr}{day} \right] \div \left[\text{HHV, } \frac{Btu}{scf} \right] \div \left[\frac{1,000 scf}{Mscf} \right]$$

Table B.12. - Separator Burner Criteria Pollutant Emissions

Pollutant	Emission Factor, lb/10 ⁶ scf	Emission Factor, lb/MMBtu	Emission Rate, lb/hr	Emission Rate, tpy
PM ₁₀ ¹	7.6	0.007	0.022	0.098
PM _{2.5} ¹	7.6	0.007	0.022	0.098
SO ₂	0.6	0.001	0.002	0.008
NO _x	100	0.098	0.294	1.288
CO	84	0.082	0.247	1.082
VOC	5.5	0.005	0.016	0.071

Note: Based on EPA AP-42, Section 1.4, Natural Gas Combustion (Tables 1.4-1 and 1.4-2). Emission factors converted from lb/10⁶ scf to lb/MMBtu by dividing by the average heat value of natural gas: 1,020 Btu/scf.

¹ PM₁₀ and PM_{2.5} are assumed to equal total particulate matter.

Table B.13. - Separator Burner Hazardous Air Pollutant Emissions

Pollutant	Emission Factor, lb/10 ⁶ scf	Emission Factor, lb/MMBtu	Emission Rate, lb/hr	Emission Rate, tpy
2-Methylnaphthalene	2.40E-05	2.35E-08	7.06E-08	3.09E-07
3-Methylchloranthrene	1.80E-06	1.76E-09	5.29E-09	2.32E-08
7,12-Dimethylbenz(a)anthracene	1.60E-05	1.57E-08	4.71E-08	2.06E-07
Acenaphthene	1.80E-06	1.76E-09	5.29E-09	2.32E-08
Anthracene	2.40E-06	2.35E-09	7.06E-09	3.09E-08
Benz(a)anthracene	1.80E-06	1.76E-09	5.29E-09	2.32E-08
Benzene	2.10E-03	2.06E-06	6.18E-06	2.71E-05
Benzo(a)pyrene	1.20E-06	1.18E-09	3.53E-09	1.55E-08
Benzo(b)fluoranthene	1.80E-06	1.76E-09	5.29E-09	2.32E-08
Benzo(g,h,i)perylene	1.20E-06	1.18E-09	3.53E-09	1.55E-08
Benzo(k)fluoranthene	1.80E-06	1.76E-09	5.29E-09	2.32E-08
Crysene	1.80E-06	1.76E-09	5.29E-09	2.32E-08
Dibenzo(a,h)anthracene	1.20E-06	1.18E-09	3.53E-09	1.55E-08
Dichlorobenzene	1.20E-03	1.18E-06	3.53E-06	1.55E-05
Fluoranthene	3.00E-06	2.94E-09	8.82E-09	3.86E-08
Fluorene	2.80E-06	2.75E-09	8.24E-09	3.61E-08
Formaldehyde	7.50E-02	7.35E-05	2.21E-04	9.66E-04
n-Hexane	1.80E+00	1.76E-03	5.29E-03	2.32E-02
Indeno(1,2,3-cd)pyrene	1.80E-06	1.76E-09	5.29E-09	2.32E-08
Naphthalene	6.10E-04	5.98E-07	1.79E-06	7.86E-06
Phenanathrene	1.70E-05	1.67E-08	5.00E-08	2.19E-07
Pyrene	5.00E-06	4.90E-09	1.47E-08	6.44E-08
Toluene	3.40E-03	3.33E-06	1.00E-05	4.38E-05
Total:			0.006	0.024

Note: Based on EPA AP-42, Section 1.4, Natural Gas Combustion (Table 1.4-3). Emission factors converted from lb/10⁶ scf to lb/MMBtu by dividing by the average heat value of natural gas: 1,020 Btu/scf.

Table B.14. - Separator Burner Greenhouse Gas Emissions

Pollutant	Emission Factor, kg/MMBtu	Emission Factor, lb/MMBtu	Emission Rate, lb/hr	Emission Rate, tpy
CO ₂	53.06	116.98	350.93	1,537.08
CH ₄	1.00E-03	2.20E-03	6.61E-03	0.03
N ₂ O	1.00E-04	2.20E-04	6.61E-04	2.90E-03
Total CO₂e:			351.29	1,538.67

Note: Emission factors from 40 CFR Part 98 Subpart C, Table C-1 and C-2. Converted from kilograms to pounds. Global warming potentials for CH₄ and N₂O are 25 and 298, respectively.

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
PTE Emission Calculations
Crude Oil/Condensate Storage Tanks

Table B.15. - Crude Oil/Condensate Storage Tank Vapor Sent to Flare Information

Parameter	Value
Tank Vapor Volume, scfm	9.46
Tank Vapor Heating Value, Btu/scf	1,629.68
Total Gas Volume per Hour, 10 ⁶ scf/hr	0.00057

Note: Tank vapor volume and heating value from E&P Tanks modeling run.

Table B.16. - Crude Oil/Condensate Storage Tank Vapor Sent to Flare Criteria Pollutant Emissions

Pollutant	Emission Factor, lb/10 ⁶ scf	Emission Factor, lb/MMBtu	Emissions, lb/hr	Emissions, tpy
PM ₁₀ ¹	7.6	0.007	0.01	0.03
PM _{2.5} ¹	7.6	0.007	0.01	0.03
SO ₂	0.6	0.001	0.00	0.00
NO _x	-	0.068	0.06	0.28
CO	-	0.31	0.29	1.26
VOC	5.5	0.005	0.00	0.02

Note: Emission factors for NO_x and CO from AP-42, Section 13.5, Industrial Flares, Table 13.5-1, and calculated using the equation below:

$$NO_x \text{ and } CO, \frac{lb}{hr} = \left[HHV, \frac{Btu}{scf} \right] \times \left[\frac{scf}{hr} \right] \times \left[EF, \frac{lb}{MMBtu} \right] \times \left[\frac{MMBtu}{10^6 Btu} \right]$$

Emission factors for PM₁₀, PM_{2.5}, SO₂, and VOC from AP-42, Section 1.4, Natural Gas Combustion, Table 1.4-2, calculated using the equation below:

$$PM_{10}, PM_{2.5}, SO_2, \text{ or } VOC, \frac{lb}{hr} = \left[Total \text{ gas volume}, \frac{10^6 \text{ scf}}{hr} \right] \times \left[EF, \frac{lb}{10^6 \text{ scf}} \right] \times \frac{Produced \text{ Gas heating value} \left[\frac{btu}{scf} \right]}{Average \text{ NG heating value } (1,020) \left[\frac{btu}{scf} \right]}$$

¹ PM₁₀ and PM_{2.5} are assumed to equal total particulate matter.

Table B.17. - Crude Oil/Condensate Storage Tank Vapor Sent to Flare Hazardous Air Pollutant Emissions

Pollutant	Emission Factor, lb/10 ⁶ scf	Emission Rate, lb/hr	Emission Rate, tpy
2-Methylnaphthalene	2.40E-05	2.18E-08	9.53E-08
3-Methylchloranthrene	1.80E-06	1.63E-09	7.15E-09
7,12-Dimethylbenz(a)anthracene	1.60E-05	1.45E-08	6.35E-08
Acenaphthene	1.80E-06	1.63E-09	7.15E-09
Anthracene	2.40E-06	2.18E-09	9.53E-09
Benz(a)anthracene	1.80E-06	1.63E-09	7.15E-09
Benzene	2.10E-03	1.90E-06	8.34E-06
Benzo(a)pyrene	1.20E-06	1.09E-09	4.77E-09
Benzo(b)fluoranthene	1.80E-06	1.63E-09	7.15E-09
Benzo(g,h,i)perylene	1.20E-06	1.09E-09	4.77E-09
Benzo(k)fluoranthene	1.80E-06	1.63E-09	7.15E-09
Crysene	1.80E-06	1.63E-09	7.15E-09
Dibenzo(a,h)anthracene	1.20E-06	1.09E-09	4.77E-09
Dichlorobenzene	1.20E-03	1.09E-06	4.77E-06
Fluoranthene	3.00E-06	2.72E-09	1.19E-08
Fluorene	2.80E-06	2.54E-09	1.11E-08
Formaldehyde	7.50E-02	6.80E-05	2.98E-04
n-Hexane	1.80E+00	1.63E-03	7.15E-03
Indeno(1,2,3-cd)pyrene	1.80E-06	1.63E-09	7.15E-09
Naphthalene	6.10E-04	5.53E-07	2.42E-06
Phenanathrene	1.70E-05	1.54E-08	6.75E-08
Pyrene	5.00E-06	4.53E-09	1.99E-08
Toluene	3.40E-03	3.08E-06	1.35E-05
Total:		0.002	0.007

Note: Based on EPA AP-42, Section 1.4, Natural Gas Combustion (Table 1.4-3).

Table B.18. - Crude Oil/Condensate Storage Tank Vapor Sent to Flare Greenhouse Gas Emissions

Pollutant	Emission Factor, kg/MMBtu	Emission Factor, lb/MMBtu	Emissions, lb/hr	Emissions, tpy
CO ₂	53.06	116.98	108.19	473.85
CH ₄	1.00E-03	2.20E-03	2.04E-03	0.01
N ₂ O	1.00E-04	2.20E-04	2.04E-04	8.93E-04
Total CO₂e:			108.30	474.34

Note: Emission factors from 40 CFR Part 98 Subpart C, Table C-1 and C-2. Converted from kilograms to pounds. Global warming potentials for CH₄ and N₂O are 25 and 298, respectively.

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
PTE Emission Calculations
Crude Oil/Condensate Storage Tanks

Table B.19. - E&P Tank Modeling Results and Percent Total

Parameter	Uncontrolled Emissions			Controlled Emissions		
	E&P Tanks Model Results, tpy			E&P Tanks Model Results, tpy		
	Flashing	Working & Breathing	Total	Flashing	Working & Breathing	Total
Total Emissions	146.87	30.99	177.82	2.94	0.62	3.56
Emissions per Tank	14.69	3.10	17.78	0.29	0.06	0.36
Percent of Total	82.6%	17.4%	100%	82.6%	17.4%	100%

Note: Flashing and working & breathing losses are only provided for uncontrolled emissions in the E&P Tank model. These percentages of the total (83% for flashing emissions and 17% for working & breathing emissions) were used to estimate emissions for other pollutants (below, in Table B.20).

Table B.20. - Crude Oil/Condensate Storage Tank Emissions

Parameter	Uncontrolled Emissions				Controlled Emissions							
	E&P Tanks Model Results				E&P Tanks Model Results, tpy			Calculated Tank Vapor Combustion Emissions, tpy	Total Emissions		Emissions per Tank	
	Flashing	Working & Breathing	Total, lb/hr	Total, tpy	Flashing	Working & Breathing	Total, tpy		lb/hr	tpy	lb/hr	tpy
VOC	69.03	14.57	19.08	83.57	1.38	0.29	1.67	0.02	0.39	1.69	0.04	0.17
Total CO ₂ e	1,474.45	311.13	407.56	1,785.11	34.15	7.21	41.35	474.34	117.74	515.69	11.77	51.57
CH ₄	58.79	12.40	16.25	71.17	1.18	0.25	1.42	0.01	0.33	1.43	0.03	0.14
CO ₂	4.76	1.00	1.32	5.76	4.76	1.00	5.76	473.85	109.50	479.61	10.95	47.96
N ₂ O	-	-	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00
Total HAPs	2.85	0.60	0.79	3.45	0.06	0.01	0.07	0.01	0.02	0.08	0.00	0.01
Benzene	0.30	0.06	0.08	0.36	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.00
Toluene	0.25	0.05	0.07	0.30	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.00
Ethylbenzene	0.01	0.00	0.00	0.01	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00
Xylene	0.07	0.01	0.02	0.08	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00
n-C6	2.23	0.47	0.62	2.70	0.04	0.01	0.05	0.01	0.01	0.06	0.00	0.01
2,2,4-Trimethylpentane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00
H ₂ S	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00
PM ₁₀	-	-	-	-	-	-	-	0.03	0.01	0.03	0.00	0.00
PM _{2.5}	-	-	-	-	-	-	-	0.03	0.01	0.03	0.00	0.00
SO ₂	-	-	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00
NO _x	-	-	-	-	-	-	-	0.28	0.06	0.28	0.01	0.03
CO	-	-	-	-	-	-	-	1.26	0.29	1.26	0.03	0.13

Note: Uncontrolled and controlled emissions from E&P Tank model run using oil analyses dated May, 2018, included in this appendix. Crude oil/condensate production is based on the daily production average for the first month of production, then multiplied by 365 to get the estimated annual PTE. Assumed 98% control efficiency for the flare. Flashing and working & breathing losses estimated for the pollutants above as a percentage of their total emissions (see Table B.19). For example, total uncontrolled flashing emissions was equal to 83% of total uncontrolled emissions. Therefore, for VOC, flashing emissions are 837% of total uncontrolled VOC emissions. Emissions in pounds per hour assumed to occur over 8,760 hours per year.

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
PTE Emission Calculations
Produced Water Tanks

Table B.21. - Produced Water Tanks Emissions

Pollutant	Uncontrolled Emissions		Controlled Emissions	
	lb/hr	tpy	lb/hr	tpy
VOC	0.04	0.16	7.09E-04	3.11E-03
Total CO ₂ e	0.41	1.81	0.06	0.28
CH ₄	0.01	0.06	2.84E-04	1.24E-03
CO ₂	0.06	0.25	0.06	0.25
Total HAPs	6.88E-04	3.01E-03	1.38E-05	6.03E-05
Benzene	7.22E-05	3.16E-04	1.44E-06	6.32E-06
Toluene	6.04E-05	2.65E-04	1.21E-06	5.29E-06
Ethylbenzene	1.99E-06	8.73E-06	3.99E-08	1.75E-07
Xylene	1.63E-05	7.13E-05	3.25E-07	1.43E-06
n-C6	5.38E-04	2.35E-03	1.08E-05	4.71E-05
2,2,4-Trimethylpentane	0.00	0.00	0.00	0.00
H ₂ S	0.00	0.00	0.00	0.00

Note: Produced water tank emissions from EPA TANKS modeling run. Speciated HAPs are assumed to have the same proportion of emissions (HAP to VOC) as the crude oil/ condensate storage tanks. Assumed 98% control efficiency for the flare. Emissions in pounds per hour assumed to occur over 8,760 hours per year.

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
PTE Emission Calculations
Steffes Engineered Flare Pilot

Table B.22. - Steffes Engineered Flare Pilot Information

Parameter	Value
Flare Pilot Usage, hours	8,760
Number of Flares	2
Flare Pilot Gas, scfm	0.2
Flare Pilot Gas Heating Value, Btu/scf	1,971.5
Total Gas Volume per Hour per Flare, 10 ⁶ scf/hr	0.00001
Flare Control Efficiency	98%

Note: Flare pilot gas conservatively assumed and gas heating value is weighted averaged from a produced gas analyses dated March 23, 2018.

Table B.23. - Steffes Engineered Flare Pilot Criteria Pollutant Emissions

Pollutant	Emission Factor, lb/10 ⁶ scf	Emission Factor, lb/MMBtu	Emissions, lb/hr	Emissions, tpy
PM ₁₀ ¹	7.6	0.007	3.23E-04	1.42E-03
PM _{2.5} ¹	7.6	0.007	3.23E-04	1.42E-03
SO ₂	0.6	0.001	2.55E-05	1.12E-04
NO _x	-	0.068	2.95E-03	1.29E-02
CO	-	0.31	0.01	5.89E-02
VOC	5.5	0.005	2.34E-04	1.02E-03

Note: Emission factors for NO_x and CO from AP-42, Section 13.5, Industrial Flares, Table 13.5-1, and calculated using the equation below:

$$NO_x \text{ and } CO, \frac{lb}{hr} = \left[HHV, \frac{Btu}{scf} \right] \times \left[\frac{scf}{hr} \right] \times \left[EF, \frac{lb}{MMBtu} \right] \times \left[\frac{MMBtu}{10^6 Btu} \right]$$

Emission factors for PM₁₀, PM_{2.5}, SO₂, and VOC from AP-42, Section 1.4, Natural Gas Combustion, Table 1.4-2, calculated using the equation below:

$$PM_{10}, PM_{2.5}, SO_2, \text{ or } VOC, \frac{lb}{hr} = \left[Total \text{ gas volume, } \frac{10^6 \text{ scf}}{hr} \right] \times \left[EF, \frac{lb}{10^6 \text{ scf}} \right] \times \frac{Produced \text{ Gas heating value } \left[\frac{btu}{scf} \right]}{Average \text{ NG heating value } (1,020) \left[\frac{btu}{scf} \right]}$$

¹ PM₁₀ and PM_{2.5} are assumed to equal total particulate matter.

Table B.24. - Steffes Engineered Flare Pilot Hazardous Air Pollutant Emissions

Pollutant	Emission Factor, lb/10 ⁶ scf	Emission Rate, lb/hr	Emission Rate, tpy
2-Methylnaphthalene	2.40E-05	1.02E-09	4.47E-09
3-Methylchloranthrene	1.80E-06	7.65E-11	3.35E-10
7,12-Dimethylbenz(a)anthracene	1.60E-05	6.80E-10	2.98E-09
Acenaphthene	1.80E-06	7.65E-11	3.35E-10
Anthracene	2.40E-06	1.02E-10	4.47E-10
Benz(a)anthracene	1.80E-06	7.65E-11	3.35E-10
Benzene	2.10E-03	8.93E-08	3.91E-07
Benzo(a)pyrene	1.20E-06	5.10E-11	2.23E-10
Benzo(b)fluoranthene	1.80E-06	7.65E-11	3.35E-10
Benzo(g,h,i)perylene	1.20E-06	5.10E-11	2.23E-10
Benzo(k)fluoranthene	1.80E-06	7.65E-11	3.35E-10
Crysene	1.80E-06	7.65E-11	3.35E-10
Dibenzo(a,h)anthracene	1.20E-06	5.10E-11	2.23E-10
Dichlorobenzene	1.20E-03	5.10E-08	2.23E-07
Fluoranthene	3.00E-06	1.28E-10	5.59E-10
Fluorene	2.80E-06	1.19E-10	5.21E-10
Formaldehyde	7.50E-02	3.19E-06	1.40E-05
n-Hexane	1.80E+00	7.65E-05	3.35E-04
Indeno(1,2,3-cd)pyrene	1.80E-06	7.65E-11	3.35E-10
Naphthalene	6.10E-04	2.59E-08	1.14E-07
Phenanathrene	1.70E-05	7.23E-10	3.17E-09
Pyrene	5.00E-06	2.13E-10	9.31E-10
Toluene	3.40E-03	1.45E-07	6.33E-07
Total:		8.00E-05	3.51E-04

Note: Based on EPA AP-42, Section 1.4, Natural Gas Combustion (Table 1.4-3).

Table B.25. - Steffes Engineered Flare Pilot Greenhouse Gas Emissions

Pollutant	Emission Factor, kg/MMBtu	Emission Factor, lb/MMBtu	Emissions, lb/hr	Emissions, tpy
CO ₂	53.06	116.98	5.07	22.22
CH ₄	1.00E-03	2.20E-03	9.56E-05	4.19E-04
N ₂ O	1.00E-04	2.20E-04	9.56E-06	4.19E-05
Total CO₂e:			5.08	22.24

Note: Emission factors from 40 CFR Part 98 Subpart C, Table C-1 and C-2. Converted from kilograms to pounds. Global warming potentials for CH₄ and N₂O are 25 and 298, respectively.

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
PTE Emission Calculations
Fugitive Leaks

Table B.26. - Fugitive Emissions: Emission Factors for Total Hydrocarbon (THC) Emissions

Equipment Type	Equipment Service Category, lb/hr/source			
	Gas	Heavy Oil (< 20° API)	Light Oil (>20° API)	Water/Light Oil
Valves	9.92E-03	1.85E-05	5.51E-03	2.16E-04
Pump Seals	5.29E-03	-	2.87E-02	5.29E-05
Others	1.94E-02	7.05E-05	1.65E-02	3.09E-02
Connectors	4.41E-04	1.65E-05	4.63E-04	2.43E-04
Flanges	8.60E-04	8.60E-07	2.43E-04	6.39E-06
Open-Ended Lines	4.41E-03	3.09E-04	3.09E-03	5.51E-04

Note: From US EPA Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017). Emission factors converted from kg/source-hr to lb/source-hr. The water/light oil emission factors apply to water streams in light oil service with water content between 50% and 99%. For streams with water content > 99%, the emission rate is considered negligible. The "other" equipment type includes compressor, pressure relief valves, diaphragms, drains, dump arms, hatches, instruments, meters, polished rods, and vents.

Table B.27. - Fugitive THC Emissions

Equipment Type	Number of Components	Service	Emission Factor, lb/hr/source	THC Emissions, lb/hr	THC Emissions, tpy
Valves	78	Gas	9.92E-03	0.77	3.39
Valves	78	Light Oil	5.51E-03	0.43	1.88
Valves	8	Water/Light Oil	2.16E-04	0.00	0.01
Pump Seals	0	Gas	5.29E-03	0.00	0.00
Pump Seals	0	Light Oil	2.87E-02	0.00	0.00
Pump Seals	0	Water/Light Oil	5.29E-05	0.00	0.00
Others	0	Gas	1.94E-02	0.00	0.00
Others	0	Light Oil	1.65E-02	0.00	0.00
Others	0	Water/Light Oil	3.09E-02	0.00	0.00
Connectors	672	Gas	4.41E-04	0.30	1.30
Connectors	354	Light Oil	4.63E-04	0.16	0.72
Connectors	52	Water/Light Oil	2.43E-04	0.01	0.06
Flanges	4	Gas	8.60E-04	0.00	0.02
Flanges	0	Light Oil	2.43E-04	0.00	0.00
Flanges	0	Water/Light Oil	6.39E-06	0.00	0.00
Open-Ended Lines	0	Gas	4.41E-03	0.00	0.00
Open-Ended Lines	0	Light Oil	3.09E-03	0.00	0.00
Open-Ended Lines	0	Water/Light Oil	5.51E-04	0.00	0.00
Total THC Emissions:				1.68	7.38

Note: Number of components estimated from actual counts performed at similar facilities.

Table B.28. - Speciated Fugitive Emission Factors

Pollutant	Weight Fraction	Weight Fraction	Weight Fraction	Emissions, lb/hr	Emissions, tpy
	Gas	Light Oil	Water/Light Oil		
THC	1.0000	1.0000	1.0000	1.68	7.37
VOC	0.6115	0.9993	0.9993	1.26	5.54
Total CO ₂ e	-	-	-	4.80	21.02
CH ₄	0.18	0.0000	0.0000	0.19	0.84
CO ₂	0.01	0.0000	0.0000	0.01	0.03
Total HAPs	0.033	0.0544	0.0544	0.07	0.30
Benzene	0.003	0.0044	0.0044	0.01	0.02
Toluene	0.007	0.0114	0.0114	0.01	0.06
Ethylbenzene	0.001	0.0010	0.0010	0.00	0.01
Xylenes	0.006	0.0094	0.0094	0.01	0.05
n-Hexane	0.017	0.0281	0.0281	0.04	0.16
2,2,4-Trimethylpentane	0.000	0.0000	0.0000	0.00	0.00
H ₂ S	0.000	0.0000	0.0000	0.00	0.00

Note: Water/Light Oil and Light Oil Weight fractions based on E&P Tank modeling run flashed gas results for the oil storage tanks. All stream weight fractions for organic compounds used in calculations are normalized based on 100% THC since EPA emission factors are based on THC emission rate. Produced Gas speciated HAPs are proportionally based on the speciated HAPs in the E&P TANK v2.0 flashed gas results, then normalized based on 100% THC.

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
PTE Emission Calculations
Truck Loading

Table B.29. - Truck Loading Emissions Calculation Inputs - Produced Water Only

Parameter	Value
Saturation Factor (S)	0.6
True Vapor Pressure of Liquid Loaded (P), psia	0.24
Molecular Weight of Vapors (M), lb/lb-mole	20.68
Temperature of Bulk Liquid Loaded (T), °F	41.45
Loading Losses, lb/1,000 gallons	0.08
Water Production, BPD	925.7
Average Water Loadout Rate, gallons/hr	1,620.0
Maximum Water Loadout Rate, gallons/hr	7,560.0
Maximum Yearly Throughput, gallons/yr	14,191,509

Note: Loading losses based on EPA AP-42 Section 5.2-4:

$$L_L = 12.46 \frac{SPM}{(T + 460)}$$

Saturation factor based on submerged loading: dedicated normal service. Molecular weight of vapors and liquid bulk temperature from EPA Tank run. TVP of liquid loaded is assumed to be the maximum vapor pressure from hottest month (July) to be conservative. Produced water production based on daily average from first 51/56 days of production.

Table B.30. - Truck Loading Emissions in Tons Per Year

Pollutant	Weight Fraction	Produced Water Loading	
		lb/hr	tpy
THC	0.9614	0.55	0.51
VOC	0.2337	0.13	0.12
Total CO ₂ e	-	7.85	7.37
CH ₄	0.5521	0.31	0.29
CO ₂	0.0371	0.02	0.02
Total HAPs	0.0061	0.00	0.00
Benzene	0.0007	0.00	0.00
Toluene	0.0005	0.00	0.00
Ethylbenzene	0.0000	0.00	0.00
Xylenes	0.0001	0.00	0.00
n-Hexane	0.0048	0.00	0.00
2,2,4-Trimethylpentane	0.0000	0.00	0.00
H ₂ S	0.0000	0.00	0.00

Note: Weight fractions based on E&P Tank modeling run working and breathing gas composition for the crude oil/condensate storage tanks, which is included in this appendix. Truck loading emissions in lb/hr use maximum loadout rate. Note that crude oil/condensate is removed from site via pipeline so no loading emissions for crude oil/condensate are calculated.

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
PTE Emission Calculations
Generator Engine

Table B.31. - Engine Information

Parameter	Value
Maximum Stand-By Power (kW) ¹	604
Maximum Stand-By Power (hp) ¹	810
Number of Units	1
Fuel	Diesel
Annual Hours of Operation per Unit (hr)	8,760
Diesel Fuel Heating Value (Btu/lb)	19,300
Estimated Heat Input (MMBtu/hr)	5.00
Fuel Flow (gallons/hr) ¹	36.50
Fuel Flow (lb/hr)	259.15
Density of Fuel (lb/gallon)	7.10
Annual Fuel Consumption (MMBtu/year)	43,813.97

¹ Values from engine manufacturer's specifications.

Table B.32. - Uncontrolled Generator Engine Emissions

Component	AP-42 Emission Factor ¹		EPA Tier 2 Emission Factor ²			Uncontrolled Emission Rate	
	lb/MMBtu	lb/bhp-hr	g/kW-hr	g/bhp-hr	lb/bhp-hr	lb/hr	tons/year
NO _x	4.41	0.03	5.92	4.41	9.73E-03	7.88	34.51
NMHC+NO _x	-	-	6.40	4.77	1.05E-02	-	-
CO	0.95	0.01	3.50	2.61	5.75E-03	4.66	20.41
VOCs	0.36	2.51E-03	0.48	0.36	7.94E-04	0.64	2.82
Formaldehyde	1.18E-03	7.29E-06	1.40E-03	1.04E-03	2.30E-06	1.86E-03	0.01
PM _{2.5}	-	-	0.20	0.15	3.29E-04	0.27	1.17
PM ₁₀	0.31	2.20E-03	0.20	0.15	3.29E-04	0.27	1.17
PM	-	-	0.20	0.15	3.29E-04	0.27	1.17
SO ₂	0.29	2.05E-03	-	-	-	1.66	7.27
CH ₄	6.61E-03	-	-	-	-	0.03	0.14
N ₂ O	1.32E-03	-	-	-	-	0.01	0.03
CO ₂	164.00	1.15	-	-	-	931.50	4,079.97
CO ₂ e ³	164.00	1.15	-	-	-	934.30	4,092.23

¹ Emission factors for CH₄ and N₂O from 40 CFR Part 98 Subpart C, Table C-1 and C-2, converted from kilograms to pounds. All other emission factors from AP-42 Chapter 3 Section 3 – *Gasoline and Diesel Industrial Engines*, Table 3.3-1 - Emission Factors for Uncontrolled Gasoline and Diesel Industrial Engines, dated October 1996.

² Engine will be compliant with the EPA exhaust emission standards for nonroad compression-ignition engines applicable to its model year available online at: <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1000A05.pdf>. EPA Tier 2 final emission rates (g/kW-hr) are used as the basis for emission calculations of NO_x, CO, VOC, PM, and HAPs since the genset is EPA Tier 2 certified according to manufacturer information. It is assumed that PM = PM₁₀ = PM_{2.5}. Engine emissions of NO_x are determined based on the Tier 2 emission rate (g/kW-hr) for Non-Methane-Hydrocarbon + NO_x emission factor and then the NO_x emissions alone are determined based on the ratio of the AP-42 factors of NO_x and VOC to establish a NO_x-specific emission factor from the Tier 2 emission rate. Tier 2 VOC-specific emission factor is determined in the same manner. It is conservatively assumed that the "NMHC" emissions are equivalent to VOC emissions. The formaldehyde emission factor is based on the Tier 2 VOC-specific emission factor and the ratio of AP-42 emission factor for formaldehyde to the AP-42 emission factor for VOC. See example calculations below:

$$\text{Tier 2 NO}_x \text{ EF} = \text{Tier 2 NMHC} + \text{NO}_x \text{ EF} \times \frac{\text{AP} - 42 \text{ NO}_x \text{ EF}}{(\text{AP} - 42 \text{ VOC EF} + \text{AP} - 42 \text{ NO}_x \text{ EF})}$$

$$\text{Tier 2 CH}_2\text{O EF} = \text{Tier 2 VOC EF} \times \frac{\text{AP} - 42 \text{ EF CH}_2\text{O}_2}{\text{AP} - 42 \text{ EF VOC}}$$

Table B.33. - Controlled Generator Engine Emissions

Component	Specs Emission Factor ¹		Controlled Emission Rate	
	g/kw-hr	g/bhp-hr	lb/hr	tons/year
NO _x	5.18	3.87	6.90	30.22
NMHC+NO _x	-	-	-	-
CO	0.69	0.51	0.92	4.02
VOCs	0.16	0.12	0.21	0.93
Formaldehyde	4.64E-04	3.46E-04	6.17E-04	2.70E-03
PM _{2.5}	0.11	0.08	0.15	0.65
PM ₁₀	0.11	0.08	0.15	0.65
PM	0.11	0.08	0.15	0.65
SO ₂	-	0.93	1.66	7.27
CH ₄	-	-	0.03	0.14
N ₂ O	-	-	0.01	0.03
CO ₂	699.54	521.63	931.50	4,079.97
CO ₂ e ²	699.54	521.63	934.30	4,092.23

¹ The emission factors for CO, NO_x, and VOC, and PM are based on the manufacturer's specifications. It is assumed PM = PM₁₀ = PM_{2.5}. SO₂ and CO₂ emission factors from AP-42 Chapter 3 Section 3 – *Gasoline and Diesel Industrial Engines*, Table 3.3-1 - Emission Factors for Uncontrolled Gasoline and Diesel Industrial Engines, dated October 1996. Emission factors for CH₄ and N₂O from 40 CFR Part 98 Subpart C, Table C-1 and C-2, converted from kilograms to pounds. The formaldehyde emission factor is based on the VOC emission factor and the ratio of AP-42 emission factor for formaldehyde to the AP-42 emission factor for VOC.

$$\text{Manufacturer's Spec CH}_2\text{O EF} = \text{Manufacturer's Spec VOC EF} \times \frac{\text{AP} - 42 \text{ CH}_2\text{O EF}}{\text{AP} - 42 \text{ VOC EF}}$$

² Global warming potentials obtained from Table A-1 to Subpart 98 - Global Warming Potentials Equation A-1: CO₂e = ΣGHGi x GWPi

Where:

CO₂e = Carbon dioxide equivalent (tons/year)

GHGi = Mass emissions of each GHG (tons/year)

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
PTE Emission Calculations
Generator Engine

³ Global warming potentials obtained from Table A-1 to Subpart 98 - Global Warming Potentials Equation A-1: CO₂e = ΣGHGi x GWPI

Where:

CO₂e = Carbon dioxide equivalent (tons/year)

GHGi = Mass emissions of each GHG (tons/year)

GWPI = Global warming potential for each GHG (1 for CO₂; 25 for CH₄; 298 for N₂O)

Table B.34. - Generator Engine HAP Emissions

Component	AP-42 Emission Factor ¹		EPA Tier 2 Emission Factor ²		Uncontrolled Emission Rate		Specs Emission Factor ²		Controlled Emission Rate	
	lb/MMBtu	lb/bhp-hr	g/kW-hr	g/bhp-hr	lb/hr	tons/year	g/kW-hr	g/bhp-hr	lb/hr	tons/year
1,3-Butadiene	3.91E-05	2.41E-07	4.64E-05	3.46E-05	6.18E-05	2.71E-04	1.54E-05	1.15E-05	2.05E-05	8.96E-05
Acenaphthene	1.42E-06	8.77E-09	1.68E-06	1.26E-06	2.24E-06	9.83E-06	5.58E-07	4.16E-07	7.43E-07	3.26E-06
Acenaphthylene	5.06E-06	3.12E-08	6.00E-06	4.48E-06	7.99E-06	3.50E-05	1.99E-06	1.48E-06	2.65E-06	1.16E-05
Acetaldehyde	7.67E-04	4.74E-06	9.10E-04	6.79E-04	1.21E-03	5.31E-03	3.01E-04	2.25E-04	4.01E-04	1.76E-03
Acrolein	9.25E-05	5.71E-07	1.10E-04	8.18E-05	1.46E-04	6.40E-04	3.63E-05	2.71E-05	4.84E-05	2.12E-04
Anthracene	1.87E-06	1.15E-08	2.22E-06	1.65E-06	2.95E-06	1.29E-05	7.35E-07	5.48E-07	9.79E-07	4.29E-06
Benzene	9.33E-04	5.76E-06	1.11E-03	8.25E-04	1.47E-03	6.46E-03	3.67E-04	2.73E-04	4.88E-04	2.14E-03
Benzo(a)anthracene	1.68E-06	1.04E-08	1.99E-06	1.49E-06	2.65E-06	1.16E-05	6.60E-07	4.92E-07	8.79E-07	3.85E-06
Benzo(b)fluoranthene	9.91E-08	6.12E-10	1.18E-07	8.77E-08	1.57E-07	6.86E-07	3.89E-08	2.90E-08	5.19E-08	2.27E-07
Benzo(k)fluoranthene	1.55E-07	9.57E-10	1.84E-07	1.37E-07	2.45E-07	1.07E-06	6.09E-08	4.54E-08	8.11E-08	3.55E-07
Benzo(a)pyrene	1.88E-07	1.16E-09	2.23E-07	1.66E-07	2.97E-07	1.30E-06	7.39E-08	5.51E-08	9.84E-08	4.31E-07
Benzo(g,h,i)perylene	4.89E-07	3.02E-09	5.80E-07	4.33E-07	7.72E-07	3.38E-06	1.92E-07	1.43E-07	2.56E-07	1.12E-06
Chrysene	3.53E-07	2.18E-09	4.19E-07	3.12E-07	5.58E-07	2.44E-06	1.39E-07	1.03E-07	1.85E-07	8.09E-07
Dibenz(a,h)anthracene	5.83E-07	3.60E-09	6.92E-07	5.16E-07	9.21E-07	4.03E-06	2.29E-07	1.71E-07	3.05E-07	1.34E-06
Fluoranthene	7.61E-06	4.70E-08	9.03E-06	6.73E-06	1.20E-05	5.27E-05	2.99E-06	2.23E-06	3.98E-06	1.74E-05
Fluorene	2.92E-05	1.80E-07	3.46E-05	2.58E-05	4.61E-05	2.02E-04	1.15E-05	8.56E-06	1.53E-05	6.69E-05
Indeno(1,2,3-cd)pyrene	3.75E-07	2.32E-09	4.45E-07	3.32E-07	5.92E-07	2.59E-06	1.47E-07	1.10E-07	1.96E-07	8.60E-07
Naphthalene	8.48E-05	5.24E-07	1.01E-04	7.50E-05	1.34E-04	5.87E-04	3.33E-05	2.49E-05	4.44E-05	1.94E-04
Phenanthrene	2.94E-05	1.82E-07	3.49E-05	2.60E-05	4.64E-05	2.03E-04	1.16E-05	8.62E-06	1.54E-05	6.74E-05
Pyrene	4.78E-06	2.95E-08	5.67E-06	4.23E-06	7.55E-06	3.31E-05	1.88E-06	1.40E-06	2.50E-06	1.10E-05
Toluene	4.09E-04	2.53E-06	4.85E-04	3.62E-04	6.46E-04	2.83E-03	1.61E-04	1.20E-04	2.14E-04	9.38E-04
Xylene	2.85E-04	1.76E-06	3.38E-04	2.52E-04	4.50E-04	1.97E-03	1.12E-04	8.35E-05	1.49E-04	6.53E-04
Total HAPs ³	3.87E-03	2.39E-05	4.60E-03	3.43E-03	6.12E-03	2.68E-02	1.52E-03	1.14E-03	2.03E-03	8.88E-03

¹ Emission factors from AP-42 Chapter 3 Section 3 – Gasoline and Diesel Industrial Engines, Table 3.3-2 - Speciated Organic Compound Emission Factors for Uncontrolled Diesel Engines, dated October 1996.

² Tier 2 individual HAP emission factor is based on the Tier 2 VOC-specific emission factor and the ratio of the AP-42 individual HAP emission factor to the AP-42 emission factor for VOC. Manufacturer's specification individual HAP emission factor is determined in the same manner. See example calculations below:

$$\text{Tier 2 individual HAP EF} = \text{Tier 2 VOC EF} \times \frac{\text{AP - 42 individual HAP EF}}{\text{AP - 42 VOC EF}}$$

$$\text{Manufacturer's Spec individual HAP EF} = \text{Manufacturer's Spec VOC EF} \times \frac{\text{AP - 42 individual HAP EF}}{\text{AP - 42 VOC EF}}$$

³ Total HAPs emissions include formaldehyde emissions from Tables B.32 and B.33.

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
PTE Emission Calculations
Produced Gas

Table B.35. - Produced Gas Sent to Flare Information

Parameter	Value
Produced Gas Volume, MCFD	230.90
Produced Gas Volume, scf/hr	9,620.64
Produced Gas Heating Value, Btu/scf	1,971.51
Total Gas Volume per Hour, 10 ⁶ scf/hr	0.01

Note: The well is connected to a gas sales pipeline, however data of flared gas volumes from first month of production from each well are conservatively used (anticipated flaring volumes will decrease over time relative to gas sold). Heating value based on gas analyses dated March 23, 2018 (included in this appendix).

Table B.36. - Produced Gas Sent to Flare Criteria Pollutant Emissions

Pollutant	Emission Factor, lb/10 ⁶ scf	Emission Factor, lb/MMBtu	Emissions, lb/hr	Emissions, tpy
PM ₁₀ ¹	7.6	0.007	0.14	0.62
PM _{2.5} ¹	7.6	0.007	0.14	0.62
SO ₂	0.6	0.001	0.01	0.05
NO _x	-	0.068	1.29	5.65
CO	-	0.31	5.88	25.75
VOC	5.5	0.005	0.10	0.45

Note: SO₂ and VOC emissions are calculated using fuel in Table B.36. Emission factors for NO_x and CO from AP-42, Section 13.5, Industrial Flares, Table 13.5-1, and calculated using the equation below:

$$NO_x \text{ and } CO, \frac{lb}{hr} = \left[HHV, \frac{Btu}{scf} \right] \times \left[\frac{scf}{hr} \right] \times \left[EF, \frac{lb}{MMBtu} \right] \times \left[\frac{MMBtu}{10^6 Btu} \right]$$

Emission factors for PM₁₀, PM_{2.5}, VOC, and SO₂ from AP-42, Section 1.4, Natural Gas Combustion, Table 1.4-2, calculated using the equation below:

$$PM_{10}, PM_{2.5}, \frac{lb}{hr} = \left[Total \text{ gas volume}, \frac{10^6 \text{ scf}}{hr} \right] \times \left[EF, \frac{lb}{10^6 \text{ scf}} \right] \times \frac{Produced \text{ Gas heating value} \left[\frac{btu}{scf} \right]}{Average \text{ NG heating value } (1,020) \left[\frac{btu}{scf} \right]}$$

¹ PM₁₀ and PM_{2.5} are assumed to equal total particulate matter.

Table B.37. - Produced Gas Sent to Flare Hazardous Air Pollutant Emissions

Pollutant	Emission Factor, lb/10 ⁶ scf	Emission Rate, lb/hr	Emission Rate, tpy
2-Methylnaphthalene	2.40E-05	4.46E-07	1.95E-06
3-Methylchloranthrene	1.80E-06	3.35E-08	1.47E-07
7,12-Dimethylbenz(a)anthracene	1.60E-05	2.98E-07	1.30E-06
Acenaphthene	1.80E-06	3.35E-08	1.47E-07
Anthracene	2.40E-06	4.46E-08	1.95E-07
Benz(a)anthracene	1.80E-06	3.35E-08	1.47E-07
Benzene	2.10E-03	3.91E-05	1.71E-04
Benzo(a)pyrene	1.20E-06	2.23E-08	9.77E-08
Benzo(b)fluoranthene	1.80E-06	3.35E-08	1.47E-07
Benzo(g,h,i)perylene	1.20E-06	2.23E-08	9.77E-08
Benzo(k)fluoranthene	1.80E-06	3.35E-08	1.47E-07
Crysene	1.80E-06	3.35E-08	1.47E-07
Dibenzo(a,h)anthracene	1.20E-06	2.23E-08	9.77E-08
Dichlorobenzene	1.20E-03	2.23E-05	9.77E-05
Fluoranthene	3.00E-06	5.58E-08	2.44E-07
Fluorene	2.80E-06	5.21E-08	2.28E-07
Formaldehyde	7.50E-02	1.39E-03	6.11E-03
n-Hexane	1.80E+00	3.35E-02	1.47E-01
Indeno(1,2,3-cd)pyrene	1.80E-06	3.35E-08	1.47E-07
Naphthalene	6.10E-04	1.13E-05	4.97E-05
Phenanthrene	1.70E-05	3.16E-07	1.38E-06
Pyrene	5.00E-06	9.30E-08	4.07E-07
Toluene	3.40E-03	6.32E-05	2.77E-04
Total:		0.035	0.153

Note: Based on EPA AP-42, Section 1.4, Natural Gas Combustion (Table 1.4-3).

Table B.38. - Produced Gas Sent to Flare Greenhouse Gas Emissions

Pollutant	Emission Factor, kg/MMBtu	Emission Factor, lb/MMBtu	Emissions, lb/hr	Emissions, tpy
CO ₂	53.06	116.98	2,218.73	9,718.03
CH ₄	1.00E-03	2.20E-03	0.04	0.18
N ₂ O	1.00E-04	2.20E-04	0.00	0.02
Total CO₂e:			2,221.02	9,728.07

Note: Emission factors from 40 CFR Part 98 Subpart C, Table C-1 and C-2. Converted from kilograms to pounds. Global warming potentials for CH₄ and N₂O are 25 and 298, respectively.

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
PTE Emission Calculations
Produced Gas

Table B.39. - Flare and Produced Gas Information

Parameter	Value
Flare Destruction Efficiency, %	98
Molecular Weight of Produced Gas, lb/lb-mole	33.98
HHV of Produced Gas, Btu/scf	1,971.51
Volume of Produced Gas to Flare, MCFD	230.90
Volume of Produced Gas to Flare, scf/hr	9,620.64

Note: Produced gas sent to engineered flare. Flared volumes based on first 56/51 days of production data. Heating value based on gas analyses dated March 23, 2018 (included in this appendix).

Table B.40. - Uncontrolled and Controlled Produced Gas Emissions

Pollutant	Gas Analysis Data		Uncontrolled		Controlled		Calculated Combustion Emissions, tpy	Total Controlled Emissions	
	Weight Percent	Mole Percent	lb/hr	tpy	lb/hr	tpy		lb/hr	tpy
VOC	60.35	-	520.54	2,279.97	10.41	45.60	0.45	10.51	46.05
Total CO ₂ e	-	-	3,855.37	16,886.53	82.28	360.41	9,728.07	2,303.30	10,088.47
CH ₄	17.86	-	154.00	674.54	3.08	13.49	0.18	3.12	13.67
CO ₂	0.61	-	5.28	23.14	5.28	23.14	9,718.03	2,224.01	9,741.17
N ₂ O	-	-	-	-	-	-	0.02	0.00	0.02
Total HAPs	3.28	-	28.33	124.10	0.57	2.48	0.15	0.60	2.64
Benzene	0.27	-	2.32	10.15	0.05	0.20	0.00	0.05	0.20
Toluene	0.69	-	5.95	26.07	0.12	0.52	0.00	0.12	0.52
Ethylbenzene	0.06	-	0.54	2.37	0.01	0.05	-	0.01	0.05
Xylene	0.57	-	4.88	21.36	0.10	0.43	-	0.10	0.43
n-C6	1.70	-	14.64	64.14	0.29	1.28	0.15	0.33	1.43
2,2,4-Trimethylpentane	0.00	-	0.00	0.00	0.00	0.00	-	0.00	0.00
H ₂ S	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM ₁₀	-	-	-	-	-	-	0.62	0.14	0.62
PM _{2.5}	-	-	-	-	-	-	0.62	0.14	0.62
SO ₂	-	-	-	-	-	-	0.05	0.01	0.05
NO _x	-	-	-	-	-	-	5.65	1.29	5.65
CO	-	-	-	-	-	-	25.75	5.88	25.75

Note: Speciated HAPs are proportionally based on the speciated HAPs in the E&P TANK v2.0 flashed gas results. Emission factors for NO_x and CO from AP-42, Chapter 13.5, Industrial Flares, Table 13.5-1. Emissions in tons per year assume flaring 8,760 hours per year. Uncontrolled emissions for VOC, HAPs, and H₂S were calculated using the following equation:

$$VOC, HAPs, \text{ and } H_2S \text{ uncontrolled emission rate, } \frac{lb}{hr} = \text{Molecular weight, } \frac{lb}{lb\text{-mole}} \times \frac{1 \text{ lb-mole}}{379 \text{ scf}} \times \text{Volume of gas, } \frac{scf}{hr} \times \text{Weight Percent}$$

Petroshale (US), Inc.

Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility

PTE Emission Calculations

Produced Gas Composition

Compositional Analysis			4-11H Produced Gas			104-11H Produced Gas			Weighted Avg. Produced Gas		
Species	Formula	MW	Mol Percent	Weight Percent	Molecular Weight Contribution	Mol Percent	Weight Percent	Molecular Weight Contribution	Mol Percent	Weight Percent	Molecular Weight Contribution
Nitrogen	N ₂	28.01	0.95	0.79	0.266	0.57	0.46	0.160	0.84	0.69	0.236
Methane	CH ₄	16.04	38.89	18.57	6.238	35.17	16.14	5.641	37.82	17.86	6.067
Carbon Dioxide	CO ₂	44.01	0.47	0.62	0.207	0.48	0.60	0.211	0.47	0.61	0.208
Ethane	C ₂ H ₆	30.07	22.84	20.45	6.868	23.92	20.58	7.193	23.15	20.49	6.961
Hydrogen Sulfide	H ₂ S	34.8	0.00	0.00	0.000	0.00	0.00	0.000	0.00	0.00	0.000
Propane	C ₃ H ₈	44.1	19.56	25.68	8.626	21.07	26.59	9.292	19.99	25.95	8.817
i-Butane	C ₄ H ₁₀	58.12	2.30	3.98	1.337	2.47	4.11	1.436	2.35	4.02	1.365
n-Butane	C ₄ H ₁₀	58.12	8.21	14.21	4.772	8.77	14.59	5.097	8.37	14.32	4.865
i-Pentane	C ₅ H ₁₂	71.99	1.54	3.30	1.109	1.61	3.32	1.159	1.56	3.31	1.123
n-Pentane	C ₅ H ₁₂	71.99	2.46	5.27	1.771	2.54	5.23	1.829	2.48	5.26	1.787
Hexanes +	C ₆ ⁺	86.18	2.78	7.13	2.396	3.40	8.38	2.930	2.96	7.50	2.549
Oxygen	O ₂	32	0.00	0.00	0.000	0.00	0.00	0.000	0.00	0.00	0.000
			100	100	33.589	100	100	34.947	100	100	33.978
	HHV (BTU/scf)		1,948.00	-	-	2,030.00	-	-	1,971.51	-	-

Note: it was assumed that the 4-11H produced gas analysis represented the gas produced by the Horse Camp West 2MBH well and the 104-11H produced gas analysis represented the gas produced by the Horse Camp West 2TFH well.

Condensate Properties		
4-11H API Gravity	104-11H API Gravity	Weighted Avg API Gravity
39.6	40.4	39.83

Potential-To-Emit Emission Calculations

E&P Tank Runs

Entire Facility Combined

Horse Camp West 2MBH

Production Rate (bbl/day)	699.40		409.5	
Uncontrolled Emission Summary	ton		ton	
Total HAPs	3.450	0.133	2.02	0.04
Total HC	171.120	6.645	100.178	2.004
NMHC, C2+	99.946	3.880	58.511	1.17
NMNEHC, C3+	83.573	3.246	48.926	0.979
CO2	5.761	0	3.373	
CH4	71.174	0	41.667	

Uncontrolled Recovery Information

Vapor(mscfd):	13.6200		7.97	
HC Vapor(mscfd):	13.2700		7.77	
CO2(mscfd):	0.00			
CH4(mscfd):	0.00			
GOR(SCF/STB):	19.47		19.46	

Component	Uncontrolled Controlled		Uncontrolled Controlled	
	ton	ton	ton	ton
H2S	0.0000	0.0000	0.0000	0.0000
O2	0.0000	0.0000	0.0000	0.0000
CO2	5.7610	5.7610	3.3730	3.3730
N2	0.9380	0.9380	0.5490	0.5490
C1	71.1740	1.4230	41.6670	0.8330
C2	16.3730	0.3280	9.5850	0.1920
C3	22.3410	0.4480	13.0790	0.2620
i-C4	13.9710	0.2800	8.1790	0.1640
n-C4	15.2350	0.3040	8.9190	0.1780
i-C5	10.3380	0.2060	6.0520	0.1210
n-C5	8.1420	0.1620	4.7660	0.0950
C6	4.2740	0.0850	2.5020	0.0500
Benzene	0.3620	0.0070	0.2120	0.0040
Toluene	0.3030	0.0070	0.1770	0.0040
E-Benzene	0.0100	0.0000	0.0060	0.0000
Xylenes	0.0816	0.0010	0.0470	0.0010
n-C6	2.6960	0.0540	1.5780	0.0320
224Trimethylp	0.0000	0.0000	0.0000	0.0000
C7	3.7560	0.0750	2.1990	0.0440
C8	1.6390	0.0320	0.9600	0.0190
C9	0.4260	0.0090	0.2490	0.0050
C10+	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000
Total	177.8200	10.1200	104.0990	5.9260

Potential-To-Emit Emission Calculations

E&P Tank Runs

Entire Facility Combined

Horse Camp West 2MBH

Component	Entire Facility Combined							Horse Camp West 2MBH						
	MW lb/lbmol	LP Oil mole%	Flash Oil mole%	Sales Oil mole%	Flash Gas mole%	W&S Gas mole%	Total mole%	LP Oil mole%	Flash Oil mole%	Sales Oil mole%	Flash Gas mole%	W&S Gas mole%	Total mole%	
H2S	34.80	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
O2	32.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
CO2	44.01	0.0800	0.0260	0.0019	1.6687	3.7141	1.9960	0.0800	0.0260	0.0019	1.6687	3.7141	1.9960	
N2	28.01	0.0200	0.0009	0.0000	0.5806	0.1431	0.5106	0.0200	0.0009	0.0000	0.5806	0.1431	0.5106	
C1	16.04	2.6500	0.3584	0.0006	70.0127	55.2139	67.6445	2.6500	0.3584	0.0006	70.0127	55.2139	67.6445	
C2	30.07	0.3900	0.1808	0.0675	6.5394	17.5551	8.3023	0.3900	0.1808	0.0675	6.5394	17.5551	8.3023	
C3	44.10	0.9200	0.6987	0.6426	7.4245	9.3012	7.7249	0.9200	0.6987	0.6426	7.4245	9.3012	7.7249	
i-C4	58.12	0.9800	0.8895	0.8705	3.6407	3.7936	3.6652	0.9800	0.8895	0.8705	3.6407	3.7936	3.6652	
n-C4	58.12	1.4700	1.3846	1.3670	3.9809	4.0791	3.9966	1.4700	1.3846	1.3670	3.9809	4.0791	3.9966	
i-C5	72.15	2.0500	2.0455	2.0445	2.1818	2.2002	2.1848	2.0500	2.0455	2.0445	2.1818	2.2002	2.1848	
n-C5	72.15	2.1600	2.1750	2.1779	1.7185	1.7306	1.7205	2.1600	2.1750	2.1779	1.7185	1.7306	1.7205	
C6	84.00	3.4500	3.5410	3.5590	0.7751	0.7794	0.7758	3.4500	3.5410	3.5590	0.7751	0.7794	0.7758	
Benzene	78.11	0.4300	0.4422	0.4447	0.0705	0.0709	0.0705	0.4300	0.4422	0.4447	0.0705	0.0709	0.0705	
Toluene	92.14	1.1000	1.1357	1.1428	0.0501	0.0505	0.0502	1.1000	1.1357	1.1428	0.0501	0.0505	0.0502	
E-Benzene	106.17	0.1000	0.1034	0.1040	0.0015	0.0015	0.0015	0.1000	0.1034	0.1040	0.0015	0.0015	0.0015	
Xylenes	106.17	0.9000	0.9302	0.9362	0.0116	0.0117	0.0116	0.9000	0.9302	0.9362	0.0116	0.0117	0.0116	
n-C6	86.18	2.7200	2.7963	2.8114	0.4764	0.4791	0.4768	2.7200	2.7963	2.8114	0.4764	0.4791	0.4768	
224Trimethylp	114.24	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
C7	100.20	7.9400	8.1900	8.2396	0.5898	0.5935	0.5904	7.9400	8.1900	8.2396	0.5898	0.5935	0.5904	
C8	114.23	9.6900	10.0120	10.0758	0.2250	0.2267	0.2252	9.6900	10.0120	10.0758	0.2250	0.2267	0.2252	
C9	128.28	6.5600	6.7814	6.8253	0.0521	0.0557	0.0527	6.5600	6.7814	6.8253	0.0521	0.0557	0.0527	
C10+	301.00	56.3900	58.3083	58.6887	0.0000	0.0000	0.0000	56.3900	58.3083	58.6887	0.0000	0.0000	0.0000	
		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
		LP Oil	Flash Oil	Sales Oil	Flash Gas	W&S Gas	Total Emission	LP Oil	Flash Oil	Sales Oil	Flash Gas	W&S Gas	Total Emission	
MW (lb/lbmol):		209.36	215.58	216.79	26.68	29.40	27.11	209.36	215.58	216.79	26.68	29.4	27.11	
Stream Mole Ratio:		1.00	0.97	0.96	0.03	0.01	0.04	1	0.9671	0.9608	0.0329	0.0063	0.0392	
Stream Weight Ratio:		209.36	208.49	208.29	0.88	0.19	1.06	209.36	208.49	208.29	0.88	0.19	1.06	
Total Emission (ton):					146.875	30.992	177.820				85.983	18.143	104.099	
Heating Value (BTU/scf):					1,526.60	1,629.68	1,543.10				1,526.60	1,629.68	1,543.10	
Gas Gravity (Gas/Air):					0.92	1.01	0.94				0.92	1.01	0.94	
Bubble Pt. @100°F		97.56	18.02	5.25				97.56	18.02	5.25				
RVP @100°F (psia)		13.38	5.45	3.98				13.38	5.45	3.98				
Spec. Gravity @100°F		0.724	0.726	0.726				0.724	0.726	0.726				

Potential-To-Emit Emission Calculations

E&P Tank Runs

Horse Camp West 2TFH

Horse Camp 2-11H

Production Rate (bbl/day)	129.4	
Uncontrolled Emission Summary	ton	
Total HAPs	0.6400	0.0130
Total HC	31.6660	0.6330
NMHC, C2+	18.4950	0.3700
NMNEHC, C3+	15.4650	0.3090
CO2	1.0660	
CH4	13.1710	

91.8	
ton	
0.450	0.009
22.462	0.449
13.120	0.262
10.970	0.219
0.756	0.756
9.343	0.187

Uncontrolled Recovery Information

Vapor(mscfd):	2.52
HC Vapor(mscfd):	2.46
CO2(mscfd):	
CH4(mscfd):	
GOR(SCF/STB):	19.47

1.7900
1.7400
19.49

Component	Uncontrolled Controlled	
	ton	ton
H2S	0.0000	0.0000
O2	0.0000	0.0000
CO2	1.0660	1.0660
N2	0.1740	0.1740
C1	13.1710	0.2630
C2	3.0300	0.0610
C3	4.1340	0.0830
i-C4	2.5850	0.0520
n-C4	2.8190	0.0560
i-C5	1.9130	0.0380
n-C5	1.5070	0.0300
C6	0.7910	0.0160
Benzene	0.0670	0.0010
Toluene	0.0560	0.0010
E-Benzene	0.0020	0.0000
Xylenes	0.0156	0.0000
n-C6	0.4990	0.0100
224Trimethylp	0.0000	0.0000
C7	0.6950	0.0140
C8	0.3030	0.0060
C9	0.0790	0.0020
C10+	0.0000	0.0000
	0.0000	0.0000
Total	32.9060	1.8730

Uncontrolled Controlled	
ton	ton
0.000	0.000
0.000	0.000
0.756	0.756
0.123	0.123
9.343	0.187
2.149	0.043
2.933	0.059
1.834	0.037
2.000	0.040
1.357	0.027
1.069	0.021
0.561	0.011
0.047	0.001
0.040	0.001
0.001	0.000
0.011	0.000
0.354	0.007
0.000	0.000
0.493	0.010
0.215	0.004
0.056	0.001
0.000	0.000
23.342	1.328

Potential-To-Emit Emission Calculations

E&P Tank Runs

Horse Camp West 2TFH

Horse Camp 2-11H

Component	Horse Camp West 2TFH						Horse Camp 2-11H					
	LP Oil mole%	Flash Oil mole%	Sales Oil mole%	Flash Gas mole%	W&S Gas mole%	Total mole%	LP Oil mole%	Flash Oil mole%	Sales Oil mole%	Flash Gas mole%	W&S Gas mole%	Total mole%
H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
O2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CO2	0.0800	0.0260	0.0019	1.6687	3.7141	1.9960	0.0800	0.0260	0.0019	1.6687	3.7141	1.9960
N2	0.0200	0.0009	0.0000	0.5806	0.1431	0.5106	0.0200	0.0009	0.0000	0.5806	0.1431	0.5106
C1	2.6500	0.3584	0.0006	70.0127	55.2139	67.6445	2.6500	0.3584	0.0006	70.0127	55.2139	67.6445
C2	0.3900	0.1808	0.0675	6.5394	17.5551	8.3023	0.3900	0.1808	0.0675	6.5394	17.5551	8.3023
C3	0.9200	0.6987	0.6426	7.4245	9.3012	7.7249	0.9200	0.6987	0.6426	7.4245	9.3012	7.7249
i-C4	0.9800	0.8895	0.8705	3.6407	3.7936	3.6652	0.9800	0.8895	0.8705	3.6407	3.7936	3.6652
n-C4	1.4700	1.3846	1.3670	3.9809	4.0791	3.9966	1.4700	1.3846	1.3670	3.9809	4.0791	3.9966
i-C5	2.0500	2.0455	2.0445	2.1818	2.2002	2.1848	2.0500	2.0455	2.0445	2.1818	2.2002	2.1848
n-C5	2.1600	2.1750	2.1779	1.7185	1.7306	1.7205	2.1600	2.1750	2.1779	1.7185	1.7306	1.7205
C6	3.4500	3.5410	3.5590	0.7751	0.7794	0.7758	3.4500	3.5410	3.5590	0.7751	0.7794	0.7758
Benzene	0.4300	0.4422	0.4447	0.0705	0.0709	0.0705	0.4300	0.4422	0.4447	0.0705	0.0709	0.0705
Toluene	1.1000	1.1357	1.1428	0.0501	0.0505	0.0502	1.1000	1.1357	1.1428	0.0501	0.0505	0.0502
E-Benzene	0.1000	0.1034	0.1040	0.0015	0.0015	0.0015	0.1000	0.1034	0.1040	0.0015	0.0015	0.0015
Xylenes	0.9000	0.9302	0.9362	0.0116	0.0117	0.0116	0.9000	0.9302	0.9362	0.0116	0.0117	0.0116
n-C6	2.7200	2.7963	2.8114	0.4764	0.4791	0.4768	2.7200	2.7963	2.8114	0.4764	0.4791	0.4768
224Trimethylp	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C7	7.9400	8.1900	8.2396	0.5898	0.5935	0.5904	7.9400	8.1900	8.2396	0.5898	0.5935	0.5904
C8	9.6900	10.0120	10.0758	0.2250	0.2267	0.2252	9.6900	10.0120	10.0758	0.2250	0.2267	0.2252
C9	6.5600	6.7814	6.8253	0.0521	0.0557	0.0527	6.5600	6.7814	6.8253	0.0521	0.0557	0.0527
C10+	56.3900	58.3083	58.6887	0.0000	0.0000	0.0000	56.3900	58.3083	58.6887	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	LP Oil	Flash Oil	Sales Oil	Flash Gas	W&S Gas	Total Emission	LP Oil	Flash Oil	Sales Oil	Flash Gas	W&S Gas	Total Emission
MW (lb/lbmol):	209.36	215.58	216.79	26.68	29.40	27.11	209.36	215.58	216.79	26.68	29.40	27.11
Stream Mole Ratio:	1	0.9671	0.9608	0.0329	0.0063	0.0392	1.0000	0.9671	0.9608	0.0329	0.0063	0.0392
Stream Weight Ratio:	209.36	208.49	208.29	0.88	0.19	1.06	209.36	208.49	208.29	0.88	0.19	1.06
Total Emission (ton):				27.179	5.735	32.906				19.280	4.068	23.342
Heating Value (BTU/scf):				1,526.60	1,629.68	1,543.10				1,526.60	1,629.68	1,543.10
Gas Gravity (Gas/Air):				0.92	1.01	0.94				0.92	1.01	0.94
Bubble Pt. @100°F	97.56	18.02	5.25				97.56	18.02	5.25			
RVP @100°F (psia)	13.38	5.45	3.98				13.38	5.45	3.98			
Spec. Gravity @100°F	0.724	0.726	0.726				0.724	0.726	0.726			

Potential-To-Emit Emission Calculations

E&P Tank Runs

Horse Camp 101-11H

Production Rate (bbl/day)	68.7	
Uncontrolled Emission Summary	ton	
Total HAPs	0.340	0.007
Total HC	16.814	0.336
NMHC, C2+	9.820	0.196
NMNEHC, C3+	8.212	0.164
CO2	0.566	0.566
CH4	6.993	0.140

Uncontrolled Recovery Information

Vapor(mscfd):	1.3400
HC Vapor(mscfd):	1.3000
CO2(mscfd):	
CH4(mscfd):	
GOR(SCF/STB):	19.5

Component	Uncontrolled Controlled	
	ton	ton
H2S	0.000	0.000
O2	0.000	0.000
CO2	0.566	0.566
N2	0.092	0.092
C1	6.993	0.140
C2	1.609	0.032
C3	2.195	0.044
i-C4	1.373	0.027
n-C4	1.497	0.030
i-C5	1.016	0.020
n-C5	0.800	0.016
C6	0.420	0.008
Benzene	0.036	0.001
Toluene	0.030	0.001
E-Benzene	0.001	0.000
Xylenes	0.008	0.000
n-C6	0.265	0.005
224Trimethylp	0.000	0.000
C7	0.369	0.007
C8	0.161	0.003
C9	0.042	0.001
C10+	0.000	0.000
Total	17.473	0.993



Potential-To-Emit Emission Calculations

E&P Tank Runs

Horse Camp 101-11H

Component	Horse Camp 101-11H						Flash Gas		W&S Gas	
	LP Oil mole%	Flash Oil mole%	Sales Oil mole%	Flash Gas mole%	W&S Gas mole%	Total mole%	Molecular wt Contribution	wt%	Molecular wt Contribution	wt%
H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.00	0.00
O2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.00	0.00
CO2	0.0800	0.0260	0.0019	1.6687	3.7141	1.9960	0.73	2.75	1.63	5.55
N2	0.0200	0.0009	0.0000	0.5806	0.1431	0.5106	0.16	0.61	0.04	0.14
C1	2.6500	0.3584	0.0006	70.0127	55.2139	67.6445	11.23	42.06	8.86	30.09
C2	0.3900	0.1808	0.0675	6.5394	17.5551	8.3023	1.97	7.36	5.28	17.94
C3	0.9200	0.6987	0.6426	7.4245	9.3012	7.7249	3.27	12.26	4.10	13.94
i-C4	0.9800	0.8895	0.8705	3.6407	3.7936	3.6652	2.12	7.92	2.20	7.49
n-C4	1.4700	1.3846	1.3670	3.9809	4.0791	3.9966	2.31	8.66	2.37	8.06
i-C5	2.0500	2.0455	2.0445	2.1818	2.2002	2.1848	1.57	5.90	1.59	5.39
n-C5	2.1600	2.1750	2.1779	1.7185	1.7306	1.7205	1.24	4.64	1.25	4.24
C6	3.4500	3.5410	3.5590	0.7751	0.7794	0.7758	0.65	2.44	0.65	2.22
Benzene	0.4300	0.4422	0.4447	0.0705	0.0709	0.0705	0.06	0.21	0.06	0.19
Toluene	1.1000	1.1357	1.1428	0.0501	0.0505	0.0502	0.05	0.17	0.05	0.16
E-Benzene	0.1000	0.1034	0.1040	0.0015	0.0015	0.0015	0.00	0.01	0.00	0.01
Xylenes	0.9000	0.9302	0.9362	0.0116	0.0117	0.0116	0.01	0.05	0.01	0.04
n-C6	2.7200	2.7963	2.8114	0.4764	0.4791	0.4768	0.41	1.54	0.41	1.40
224Trimethylp	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.00	0.00
C7	7.9400	8.1900	8.2396	0.5898	0.5935	0.5904	0.59	2.21	0.59	2.02
C8	9.6900	10.0120	10.0758	0.2250	0.2267	0.2252	0.26	0.96	0.26	0.88
C9	6.5600	6.7814	6.8253	0.0521	0.0557	0.0527	0.07	0.25	0.07	0.24
C10+	56.3900	58.3083	58.6887	0.0000	0.0000	0.0000	0.00	0.00	0.00	0.00
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.00	0.00	0.00	0.00
							26.70	100.00	29.43	100.00
	LP Oil	Flash Oil	Sales Oil	Flash Gas	W&S Gas	Total Emission				
MW (lb/lbmol):	209.36	215.58	216.79	26.68	29.40	27.11				
Stream Mole Ratio:	1.0000	0.9671	0.9608	0.0329	0.0063	0.0392				
Stream Weight Ratio:	209.36	208.49	208.29	0.88	0.19	1.06				
Total Emission (ton):				14.432	3.045	17.473				
Heating Value (BTU/scf):				1,526.60	1,629.68	1,543.10				
Gas Gravity (Gas/Air):				0.92	1.01	0.94				
Bubble Pt. @100°F	97.56	18.02	5.25							
RVP @100°F (psia)	13.38	5.45	3.98							
Spec. Gravity @100°F	0.724	0.726	0.726							

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH
Production Facility
Estimated Actual Annual Emissions Calculations
Emission Sources

Table B.1. - Emission Sources

Emission Unit	Quantity	Rating/Capacity
2-Phase Separators w/Heater Treater	2	1.0 MMBtu/hr each
2-Phase Separators w/Heater Treater	2	0.5 MMBtu/hr each
Crude Oil/Condensate Storage Tanks	10	400 BBL each
Produced Water Storage Tanks	6	400 BBL each
Flares	2	21.45 scf/hr pilot rating
Fugitive Leaks	-	-
Truck Loading	-	N/A
Generator Engine	1	402 horsepower
Produced Gas	-	-

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
Estimated Actual Annual Emissions Calculations
Emissions Summaries

Table B.2. - Summary of Uncontrolled Emissions in Pounds per Hour

Emission Source	VOC	HAPs	NO _x	CO	SO ₂	H ₂ S	PM ₁₀	PM _{2.5}	CO ₂ e
2-Phase Separators w/Heater Treater	0.02	0.01	0.29	0.25	0.00	-	0.02	0.02	351.29
(10) Crude Oil/Condensate Storage Tanks	24.69	1.02	-	-	-	0.00	-	-	527.39
(6) Produced Water Storage Tanks	0.04	0.00	-	-	-	0.00	-	-	0.46
(2) Flares Pilots	-	-	-	-	-	-	-	-	-
Fugitive Leaks	0.96	0.04	-	-	-	0.00	-	-	11.17
Truck Loading	0.26	0.01	-	-	-	0.00	-	-	4.30
(1) Generator Engine	0.64	0.01	7.88	4.66	1.66	-	0.27	0.27	934.30
Produced Gas	698.13	29.11	-	-	-	0.00	-	-	5,108.24
Total	724.73	30.19	8.17	4.91	1.66	0.00	0.29	0.29	6,937.14

Table B.3. - Summary of Uncontrolled Emissions in Tons Per Year

Emission Source	VOC	HAPs	NO _x	CO	SO ₂	H ₂ S	PM ₁₀	PM _{2.5}	CO ₂ e
2-Phase Separators w/Heater Treater	0.07	0.02	0.29	0.25	0.00	-	0.10	0.10	1,538.67
(10) Crude Oil/Condensate Storage Tanks	108.15	4.47	-	-	-	0.00	-	-	2,309.98
(6) Produced Water Storage Tanks	0.17	0.00	-	-	-	0.00	-	-	2.00
(2) Flares Pilots	-	-	-	-	-	-	-	-	-
Fugitive Leaks	4.18	0.17	-	-	-	0.00	-	-	48.90
Truck Loading	0.31	0.01	-	-	-	0.00	-	-	5.05
(1) Generator Engine	2.82	0.03	34.51	20.41	7.27	-	1.17	1.17	4,092.23
Produced Gas	3,057.79	127.48	-	-	-	0.00	-	-	22,374.09
Total	3,173.49	132.19	34.80	20.66	7.27	0.00	1.26	1.26	30,370.92

Table B.4. - Summary of Controlled Emissions in Pounds per Hour

Emission Source	VOC	HAPs	NO _x	CO	SO ₂	H ₂ S	PM ₁₀	PM _{2.5}	CO ₂ e
2-Phase Separators w/Heater Treater	0.02	0.01	0.29	0.25	0.00	-	0.02	0.02	351.29
(10) Crude Oil/Condensate Storage Tanks	0.50	0.02	0.08	0.37	0.00	0.00	0.01	0.01	152.48
(6) Produced Water Storage Tanks	0.00	0.00	-	-	-	0.00	-	-	0.07
(2) Flares Pilots	0.00	0.00	0.00	0.01	0.00	-	0.00	0.00	5.09
Fugitive Leaks	0.96	0.04	-	-	-	0.00	-	-	11.17
Truck Loading	0.26	0.01	-	-	-	0.00	-	-	4.30
(1) Generator Engine	0.21	0.00	6.90	0.92	1.66	-	0.15	0.15	934.30
Produced Gas	14.10	0.63	1.72	7.86	0.02	0.00	0.19	0.19	3,079.36
Total	16.05	0.71	9.00	9.41	1.68	0.00	0.37	0.37	4,538.06

Table B.5. - Summary of Controlled Emissions in Tons Per Year

Emission Source	VOC	HAPs	NO _x	CO	SO ₂	H ₂ S	PM ₁₀	PM _{2.5}	CO ₂ e
2-Phase Separators w/Heater Treater	0.07	0.02	1.29	1.08	0.01	-	0.10	0.10	1,538.67
(10) Crude Oil/Condensate Storage Tanks	2.19	0.10	0.36	1.63	0.00	0.00	0.04	0.04	667.85
(6) Produced Water Storage Tanks	0.00	0.00	-	-	-	0.00	-	-	0.31
(2) Flares Pilots	0.00	0.00	0.01	0.06	0.00	-	0.00	0.00	22.30
Fugitive Leaks	4.18	0.17	-	-	-	0.00	-	-	48.90
Truck Loading	0.31	0.01	-	-	-	0.00	-	-	5.05
(1) Generator Engine	0.93	0.02	30.22	4.02	7.27	-	0.65	0.65	4,092.23
Produced Gas	61.76	2.75	7.55	34.44	0.07	0.00	0.83	0.83	13,487.62
Total	69.45	3.09	39.43	41.23	7.35	0.00	1.62	1.62	19,862.93

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
Estimated Actual Annual Emissions Calculations
HAPs Emissions Summaries

Table B.6. - Summary of Uncontrolled HAP Emissions in Pounds per Hour

Hazardous Air Pollutant	Separators	Condensate Tanks	Produced Water Tanks	Flare Pilots	Fugitive Leaks	Truck Loading	Produced Gas	Generator Engine	Total
1,3-Butadiene	-	-	-	-	-	-	-	6.2E-05	6.2E-05
2-Methylnaphthalene	7.1E-08	-	-	-	-	-	-	-	7.1E-08
2,2,4-Trimethylpentane	-	0.00	0.00	-	0.00	0.00	0.00	0.0E+00	0.0E+00
3-Methylchloranthrene	5.3E-09	-	-	-	-	-	-	-	5.3E-09
7,12-Dimethylbenz(a)anthracene	4.7E-08	-	-	-	-	-	-	-	4.7E-08
Acenaphthene	5.3E-09	-	-	-	-	-	-	2.2E-06	2.2E-06
Acenaphthylene	-	-	-	-	-	-	-	8.0E-06	8.0E-06
Acetaldehyde	-	-	-	-	-	-	-	1.2E-03	1.2E-03
Acrolein	-	-	-	-	-	-	-	1.5E-04	1.5E-04
Anthracene	7.1E-09	-	-	-	-	-	-	3.0E-06	3.0E-06
Benzene	6.2E-06	0.11	8.0E-05	-	4.2E-03	1.1E-03	3.05	1.5E-03	3.16
Benzo(a)anthracene	5.3E-09	-	-	-	-	-	-	2.7E-06	2.7E-06
Benzo(a)pyrene	3.5E-09	-	-	-	-	-	-	3.0E-07	3.0E-07
Benzo(b)fluoranthene	5.3E-09	-	-	-	-	-	-	1.6E-07	1.6E-07
Benzo(k)fluoranthene	5.3E-09	-	-	-	-	-	-	2.4E-07	2.5E-07
Benzo(g,h,i)perylene	3.5E-09	-	-	-	-	-	-	-	3.5E-09
Benzo(g,h,l)perylene	-	-	-	-	-	-	-	7.7E-07	7.7E-07
Chrysene	5.3E-09	-	-	-	-	-	-	5.6E-07	5.6E-07
Dibenz(a,h)anthracene	3.5E-09	-	-	-	-	-	-	9.2E-07	9.2E-07
Dichlorobenzene	3.5E-06	-	-	-	-	-	-	-	3.5E-06
Ethylbenzene	-	3.2E-03	2.4E-06	-	1.2E-04	3.1E-05	0.09	0.0E+00	0.09
Fluoranthene	8.8E-09	-	-	-	-	-	-	1.2E-05	1.2E-05
Fluorene	8.2E-09	-	-	-	-	-	-	4.6E-05	4.6E-05
Formaldehyde	2.2E-04	-	-	-	-	-	-	1.86E-03	2.08E-03
n-Hexane	5.3E-03	0.80	5.9E-04	-	0.03	0.01	22.73	0.0E+00	23.57
Indeno(1,2,3-cd)pyrene	5.3E-09	-	-	-	-	-	-	5.9E-07	6.0E-07
Naphthalene	1.8E-06	-	-	-	-	-	-	1.3E-04	1.4E-04
Phenanthrene	5.0E-08	-	-	-	-	-	-	4.6E-05	4.6E-05
Pyrene	1.5E-08	-	-	-	-	-	-	7.6E-06	7.6E-06
Toluene	1.0E-05	0.09	6.7E-05	-	3.5E-03	9.0E-04	2.56	6.5E-04	2.65
Xylene	-	0.02	1.8E-05	-	9.3E-04	2.4E-04	0.68	4.5E-04	0.71
Total	5.54E-03	1.02	7.61E-04	0.00	0.04	0.01	29.11	0.01	30.19

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
Estimated Actual Annual Emissions Calculations
HAPs Emissions Summaries

Table B.7. - Summary of Controlled HAP Emissions in Pounds per Hour

Hazardous Air Pollutant	Separator	Condensate Tanks	Produced Water Tanks	Flare Pilot	Fugitive Leaks	Truck Loading	Produced Gas	Generator Engine	Total
1,3-Butadiene	-	-	-	-	-	-	-	2.0E-05	2.0E-05
2-Methylnaphthalene	7.1E-08	-	-	1.0E-09	-	-	-	-	7.2E-08
2,2,4-Trimethylpentane	-	0.00	0.00	-	0.00	0.00	0.00	0.0E+00	0.0E+00
3-Methylchloranthrene	5.3E-09	-	-	7.7E-11	-	-	-	-	5.4E-09
7,12-Dimethylbenz(a)anthracene	4.7E-08	-	-	6.8E-10	-	-	-	-	4.8E-08
Acenaphthene	5.3E-09	-	-	7.7E-11	-	-	-	7.4E-07	7.5E-07
Acenaphthylene	-	-	-	-	-	-	-	2.6E-06	2.6E-06
Acetaldehyde	-	-	-	-	-	-	-	4.0E-04	4.0E-04
Acrolein	-	-	-	-	-	-	-	4.8E-05	4.8E-05
Anthracene	7.1E-09	-	-	1.0E-10	-	-	-	9.8E-07	9.9E-07
Benzene	6.2E-06	2.1E-03	1.6E-06	9.0E-08	4.2E-03	1.1E-03	0.06	4.9E-04	0.07
Benzo(a)anthracene	5.3E-09	-	-	7.7E-11	-	-	-	8.8E-07	8.8E-07
Benzo(b)fluoranthene	5.3E-09	-	-	7.7E-11	-	-	-	5.2E-08	5.7E-08
Benzo(k)fluoranthene	5.3E-09	-	-	7.7E-11	-	-	-	8.1E-08	8.7E-08
Benzo(a)pyrene	3.5E-09	-	-	5.1E-11	-	-	-	9.8E-08	1.0E-07
Benzo(g,h,l)perylene	3.5E-09	-	-	5.1E-11	-	-	-	2.6E-07	2.6E-07
Chrysene	5.3E-09	-	-	7.7E-11	-	-	-	1.8E-07	1.9E-07
Dibenzo(a,h)anthracene	3.5E-09	-	-	5.1E-11	-	-	-	3.1E-07	3.1E-07
Dichlorobenzene	3.5E-06	-	-	5.1E-08	-	-	-	-	3.6E-06
Ethylbenzene	-	6.4E-05	4.8E-08	-	1.2E-04	3.1E-05	1.8E-03	0.0E+00	2.0E-03
Fluoranthene	8.8E-09	-	-	1.3E-10	-	-	-	4.0E-06	4.0E-06
Fluorene	8.2E-09	-	-	1.2E-10	-	-	-	1.5E-05	1.5E-05
Formaldehyde	2.2E-04	-	-	3.2E-06	-	-	-	6.17E-04	8.41E-04
n-Hexane	5.3E-03	0.02	1.2E-05	7.7E-05	0.03	0.01	0.50	0.0E+00	0.56
Indeno(1,2,3-cd)pyrene	5.3E-09	-	-	7.7E-11	-	-	-	2.0E-07	2.0E-07
Naphthalene	1.8E-06	-	-	2.6E-08	-	-	-	4.4E-05	4.6E-05
Phenanthrene	5.0E-08	-	-	7.2E-10	-	-	-	1.5E-05	1.5E-05
Pyrene	1.5E-08	-	-	2.1E-10	-	-	-	2.5E-06	2.5E-06
Toluene	1.0E-05	1.8E-03	1.3E-06	1.4E-07	3.5E-03	9.0E-04	0.05	2.1E-04	0.06
Xylene	-	4.7E-04	3.5E-07	-	9.3E-04	2.4E-04	0.01	1.5E-04	0.02
Total	5.54E-03	0.02	1.52E-05	8.03E-05	0.04	0.01	0.63	2.03E-03	0.71

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
Estimated Actual Annual Emissions Calculations
HAPs Emissions Summaries

Table B.8. - Summary of Uncontrolled HAP Emissions in Tons per Year

Hazardous Air Pollutant	Separator	Condensate Tanks	Produced Water Tanks	Flare Pilot	Fugitive Leaks	Truck Loading	Produced Gas	Generator Engine	Total
1,3-Butadiene	-	-	-	-	-	-	-	2.7E-04	2.7E-04
2-Methylnaphthalene	3.1E-07	-	-	-	-	-	-	-	3.1E-07
2,2,4-Trimethylpentane	-	0.00	0.00	-	0.00	0.00	0.00	0.0E+00	0.0E+00
3-Methylchloranthrene	2.3E-08	-	-	-	-	-	-	-	2.3E-08
7,12-Dimethylbenz(a)anthracene	2.1E-07	-	-	-	-	-	-	-	2.1E-07
Acenaphthene	2.3E-08	-	-	-	-	-	-	9.8E-06	9.8E-06
Acenaphthylene	-	-	-	-	-	-	-	3.5E-05	3.5E-05
Acetaldehyde	-	-	-	-	-	-	-	0.01	0.01
Acrolein	-	-	-	-	-	-	-	6.4E-04	6.4E-04
Anthracene	3.1E-08	-	-	-	-	-	-	1.3E-05	1.3E-05
Benzene	2.7E-05	0.47	3.5E-04	-	1.8E-02	1.3E-03	13.35	6.5E-03	13.85
Benzo(a)anthracene	2.3E-08	-	-	-	-	-	-	1.2E-05	1.2E-05
Benzo(b)fluoranthene	2.3E-08	-	-	-	-	-	-	6.9E-07	7.1E-07
Benzo(k)fluoranthene	2.3E-08	-	-	-	-	-	-	1.1E-06	1.1E-06
Benzo(a)pyrene	1.5E-08	-	-	-	-	-	-	1.3E-06	1.3E-06
Benzo(g,h,l)perylene	1.5E-08	-	-	-	-	-	-	3.4E-06	3.4E-06
Chrysene	2.3E-08	-	-	-	-	-	-	2.4E-06	2.5E-06
Dibenzo(a,h)anthracene	1.5E-08	-	-	-	-	-	-	4.0E-06	4.0E-06
Dichlorobenzene	1.5E-05	-	-	-	-	-	-	-	1.5E-05
Ethylbenzene	-	1.4E-02	1.0E-05	-	5.3E-04	3.6E-05	0.39	0.0E+00	0.40
Fluoranthene	3.9E-08	-	-	-	-	-	-	5.3E-05	5.3E-05
Fluorene	3.6E-08	-	-	-	-	-	-	2.0E-04	2.0E-04
Formaldehyde	9.7E-04	-	-	-	-	-	-	8.16E-03	9.13E-03
n-Hexane	0.02	3.49	2.6E-03	-	0.14	0.01	99.56	0.0E+00	103.22
Indeno(1,2,3-cd)pyrene	2.3E-08	-	-	-	-	-	-	2.6E-06	2.6E-06
Naphthalene	7.9E-06	-	-	-	-	-	-	5.9E-04	5.9E-04
Phenanathrene	2.2E-07	-	-	-	-	-	-	2.0E-04	2.0E-04
Pyrene	6.4E-08	-	-	-	-	-	-	3.3E-05	3.3E-05
Toluene	4.4E-05	0.39	2.9E-04	-	1.5E-02	1.1E-03	11.19	2.8E-03	11.60
Xylene	-	0.10	7.8E-05	-	4.1E-03	2.8E-04	2.99	2.0E-03	3.10
Total	0.02	4.46	3.33E-03	0.00	0.17	0.01	127.48	2.68E-02	132.19

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
Estimated Actual Annual Emissions Calculations
HAPs Emissions Summaries

Table B.9. - Summary of Controlled HAP Emissions in Tons per Year

Hazardous Air Pollutant	Separator	Condensate Tanks	Produced Water Tanks	Flare Pilot	Fugitive Leaks	Truck Loading	Produced Gas	Generator Engine	Total
1,3-Butadiene	-	-	-	-	-	-	-	9.0E-05	9.0E-05
2-Methylnaphthalene	3.1E-07	-	-	4.5E-09	-	-	-	-	3.1E-07
2,2,4-Trimethylpentane	-	0.00	0.00	-	0.00	0.00	0.00	0.0E+00	0.0E+00
3-Methylchloranthrene	2.3E-08	-	-	3.4E-10	-	-	-	-	2.4E-08
7,12-Dimethylbenz(a)anthracene	2.1E-07	-	-	3.0E-09	-	-	-	-	2.1E-07
Acenaphthene	2.3E-08	-	-	3.4E-10	-	-	-	3.3E-06	3.3E-06
Acenaphthylene	-	-	-	-	-	-	-	1.2E-05	1.2E-05
Acetaldehyde	-	-	-	-	-	-	-	1.76E-03	1.76E-03
Acrolein	-	-	-	-	-	-	-	2.1E-04	2.1E-04
Anthracene	3.1E-08	-	-	4.5E-10	-	-	-	4.3E-06	4.3E-06
Benzene	2.7E-05	9.4E-03	7.0E-06	3.9E-07	1.8E-02	1.3E-03	0.27	2.1E-03	0.30
Benz(a)anthracene	2.3E-08	-	-	3.4E-10	-	-	-	3.9E-06	3.9E-06
Benzo(b)fluoranthene	2.3E-08	-	-	3.4E-10	-	-	-	2.3E-07	2.5E-07
Benzo(k)fluoranthene	2.3E-08	-	-	3.4E-10	-	-	-	3.6E-07	3.8E-07
Benzo(a)pyrene	1.5E-08	-	-	2.2E-10	-	-	-	4.3E-07	4.5E-07
Benzo(g,h,l)perylene	1.5E-08	-	-	2.2E-10	-	-	-	1.1E-06	1.1E-06
Chrysene	2.3E-08	-	-	3.4E-10	-	-	-	8.1E-07	8.3E-07
Dibenzo(a,h)anthracene	1.5E-08	-	-	2.2E-10	-	-	-	1.3E-06	1.4E-06
Dichlorobenzene	1.5E-05	-	-	2.2E-07	-	-	-	-	1.6E-05
Ethylbenzene	-	2.8E-04	2.1E-07	-	5.3E-04	3.6E-05	7.7E-03	0.0E+00	8.6E-03
Fluoranthene	3.9E-08	-	-	5.6E-10	-	-	-	1.7E-05	1.7E-05
Fluorene	3.6E-08	-	-	5.2E-10	-	-	-	6.7E-05	6.7E-05
Formaldehyde	9.7E-04	-	-	1.4E-05	-	-	-	2.70E-03	3.68E-03
n-Hexane	0.02	0.08	5.2E-05	3.4E-04	0.14	0.01	2.19	0.0E+00	2.44
Indeno(1,2,3-cd)pyrene	2.3E-08	-	-	3.4E-10	-	-	-	8.6E-07	8.8E-07
Naphthalene	7.9E-06	-	-	1.1E-07	-	-	-	1.9E-04	2.0E-04
Phenanathrene	2.2E-07	-	-	3.2E-09	-	-	-	6.7E-05	6.8E-05
Pyrene	6.4E-08	-	-	9.3E-10	-	-	-	1.1E-05	1.1E-05
Toluene	4.4E-05	7.8E-03	5.8E-06	6.3E-07	1.5E-02	1.1E-03	0.22	9.4E-04	0.25
Xylene	-	2.1E-03	1.6E-06	-	4.1E-03	2.8E-04	0.06	6.5E-04	0.07
Total	0.02	0.10	6.67E-05	3.52E-04	0.17	0.01	2.75	0.01	3.06

Petroshale (US), Inc.

**Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
Estimated Actual Annual Emissions Calculations
Production Data**

Table B.10.a - Horse Camp West 2MBH First 5 Months' Production Data

Month	Days On	Oil Produced, BBLs	Water Produced, BBLs	Gas Produced, MSCF	Gas Flared, MCF
November 2018	8	6,120	8,080	4,637	4,637
December 2018	17	14,341	13,034	13,152	2,695
January 2019	31	17,759	14,340	12,213	1,347
February 2019	28	13,870	9,593	10,634	4,014
March 2019	31	15,632	10,415	12,907	370
Daily Average		588.89	482.28	465.59	113.59

Table B.10.b - Horse Camp West 2TFH First 4 Month's Production Data

Month	Days On	Oil Produced, BBLs	Water Produced, BBLs	Gas Produced, MSCF	Gas Flared, MCF
November 2018	7	840	4,464	652	652
December 2018	13	2,867	10,368	1,127	937
January 2019	31	7,295	20,176	9,203	6,765
February 2019	12	2,249	4,610	1,972	1,972
Daily Average		210.33	628.86	205.62	163.90

Table B.10.c - Horse Camp 2-11H Most Recent 12 Months' Production Data

Month	Days On	Oil Produced, BBLs	Water Produced, BBLs	Gas Produced, MSCF	Gas Flared, MCF
June 2017	30	1,668	523	1,915	56
July 2017	31	1,780	603	2,057	63
August 2017	31	1,689	591	1,924	59
September 2017	30	1,605	499	2,044	56
October 2017	31	1,659	612	2,276	58
November 2017	30	1,327	743	1,873	47
December 2017	31	1,474	525	1,787	51
January 2018	22	1,069	396	1,216	37
February 2018	16	332	1,473	422	239
March 2018	22	1,296	792	1,165	46
April 2018	20	1,205	768	1,502	942
May 2018	13	780	572	949	611
Daily Average		51.74	26.37	62.31	7.38

Petroshale (US), Inc.

**Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
Estimated Actual Annual Emissions Calculations
Production Data**

Table B.10.d - Horse Camp 101-11H Most Recent 12 Months' Production Data

Month	Days On	Oil Produced, BBLs	Water Produced, BBLs	Gas Produced, MSCF	Gas Flared, MCF
January 2015	26	1,443	606	2,580	688
February 2015	28	1,887	597	2,598	428
March 2015	31	1,922	759	2,831	371
April 2015	30	1,547	587	2,868	624
May 2015	31	1,470	503	2,721	816
June 2015	30	1,590	584	2,796	838
July 2015	31	1,988	755	2,503	1,493
August 2015	31	1,374	561	1,949	1,083
September 2015	30	1,430	643	2,044	724
October 2015	31	1,435	717	2,032	456
November 2015	29	1,417	682	2,002	347
December 2015	18	1,249	557	1,645	112
Daily Average		54.20	21.82	82.57	23.06

Table B.10.e - Daily Average Production of the Entire Facility (all 4 wells)

Well	Oil Produced Per Day, BBLs	Water Produced Per Day, BBLs	Gas Produced Per Day, MSCF	Gas Flared Per Day, MCF
Horse Camp West 2MBH	588.89	482.28	465.59	113.59
Horse Camp West 2TFH	210.33	628.86	205.62	163.90
Horse Camp 2-11H	51.74	26.37	62.31	7.38
Horse Camp 101-11H ¹	54.20	21.82	82.57	23.06
Total Facility Daily Average	905.16	1,159.33	816.09	307.94

Estimated Actual Annual Emissions Calculations

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
Estimated Actual Annual Emissions Calculations
Separator Burners

Table B.11. - Separator Burner Information

Parameter	Value
Burner Rating (each), MMBtu/hr	1.00
Number of Separator Burners	2
Burner Rating (each), MMBtu/hr	0.50
Number of Separator Burners	2
HHV, Btu/scf	1,976.96
Total Fuel Consumption, Mscf/day	36.42

Note: Fuel HHV from weighted average of Horse Camp 4-11H and Horse Camp 104-11H gas analyses dated March 23, 2018. Fuel consumption calculated using:

$$\frac{Mscf}{day} = \left[\text{Burner rating, } \frac{MMBtu}{hr} \right] \times \left[\frac{10^6 Btu}{MMBtu} \right] \times \left[\frac{24hr}{day} \right] \div \left[\text{HHV, } \frac{Btu}{scf} \right] \div \left[\frac{1,000 scf}{Mscf} \right]$$

Table B.12. - Separator Burner Criteria Pollutant Emissions

Pollutant	Emission Factor, lb/10 ⁶ scf	Emission Factor, lb/MMBtu	Emission Rate, lb/hr	Emission Rate, tpy
PM ₁₀ ¹	7.6	0.007	0.022	0.098
PM _{2.5} ¹	7.6	0.007	0.022	0.098
SO ₂	0.6	0.001	0.002	0.008
NO _x	100	0.098	0.294	1.288
CO	84	0.082	0.247	1.082
VOC	5.5	0.005	0.016	0.071

Note: Based on EPA AP-42, Section 1.4, Natural Gas Combustion (Tables 1.4-1 and 1.4-2). Emission factors converted from lb/10⁶ scf to lb/MMBtu by dividing by the average heat value of natural gas: 1,020 Btu/scf.

¹ PM₁₀ and PM_{2.5} are assumed to equal total particulate matter.

Table B.13. - Separator Burner Hazardous Air Pollutant Emissions

Pollutant	Emission Factor, lb/10 ⁶ scf	Emission Factor, lb/MMBtu	Emission Rate, lb/hr	Emission Rate, tpy
2-Methylnaphthalene	2.40E-05	2.35E-08	7.06E-08	3.09E-07
3-Methylchloranthrene	1.80E-06	1.76E-09	5.29E-09	2.32E-08
7,12-Dimethylbenz(a)anthracene	1.60E-05	1.57E-08	4.71E-08	2.06E-07
Acenaphthene	1.80E-06	1.76E-09	5.29E-09	2.32E-08
Anthracene	2.40E-06	2.35E-09	7.06E-09	3.09E-08
Benz(a)anthracene	1.80E-06	1.76E-09	5.29E-09	2.32E-08
Benzene	2.10E-03	2.06E-06	6.18E-06	2.71E-05
Benzo(a)pyrene	1.20E-06	1.18E-09	3.53E-09	1.55E-08
Benzo(b)fluoranthene	1.80E-06	1.76E-09	5.29E-09	2.32E-08
Benzo(g,h,i)perylene	1.20E-06	1.18E-09	3.53E-09	1.55E-08
Benzo(k)fluoranthene	1.80E-06	1.76E-09	5.29E-09	2.32E-08
Crysene	1.80E-06	1.76E-09	5.29E-09	2.32E-08
Dibenzo(a,h)anthracene	1.20E-06	1.18E-09	3.53E-09	1.55E-08
Dichlorobenzene	1.20E-03	1.18E-06	3.53E-06	1.55E-05
Fluoranthene	3.00E-06	2.94E-09	8.82E-09	3.86E-08
Fluorene	2.80E-06	2.75E-09	8.24E-09	3.61E-08
Formaldehyde	7.50E-02	7.35E-05	2.21E-04	9.66E-04
n-Hexane	1.80E+00	1.76E-03	5.29E-03	2.32E-02
Indeno(1,2,3-cd)pyrene	1.80E-06	1.76E-09	5.29E-09	2.32E-08
Naphthalene	6.10E-04	5.98E-07	1.79E-06	7.86E-06
Phenanathrene	1.70E-05	1.67E-08	5.00E-08	2.19E-07
Pyrene	5.00E-06	4.90E-09	1.47E-08	6.44E-08
Toluene	3.40E-03	3.33E-06	1.00E-05	4.38E-05
Total:			0.006	0.024

Note: Based on EPA AP-42, Section 1.4, Natural Gas Combustion (Table 1.4-3). Emission factors converted from lb/10⁶ scf to lb/MMBtu by dividing by the average heat value of natural gas: 1,020 Btu/scf.

Table B.14. - Separator Burner Greenhouse Gas Emissions

Pollutant	Emission Factor, kg/MMBtu	Emission Factor, lb/MMBtu	Emission Rate, lb/hr	Emission Rate, tpy
CO ₂	53.06	116.98	350.93	1,537.08
CH ₄	1.00E-03	2.20E-03	6.61E-03	0.03
N ₂ O	1.00E-04	2.20E-04	6.61E-04	2.90E-03
Total CO₂e:			351.29	1,538.67

Note: Emission factors from 40 CFR Part 98 Subpart C, Table C-1 and C-2. Converted from kilograms to pounds. Global warming potentials for CH₄ and N₂O are 25 and 298, respectively.

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
Estimated Actual Annual Emissions Calculations
Crude Oil/Condensate Storage Tanks

Table B.15. - Crude Oil/Condensate Storage Tank Vapor Sent to Flare Information

Parameter	Value
Tank Vapor Volume, scfm	12.25
Tank Vapor Heating Value, Btu/scf	1,629.68
Total Gas Volume per Hour, 10 ⁶ scf/hr	0.00074

Note: Tank vapor volume and heating value from E&P Tanks modeling run.

Table B.16. - Crude Oil/Condensate Storage Tank Vapor Sent to Flare Criteria Pollutant Emissions

Pollutant	Emission Factor, lb/10 ⁶ scf	Emission Factor, lb/MMBtu	Emissions, lb/hr	Emissions, tpy
PM ₁₀ ¹	7.6	0.007	0.01	0.04
PM _{2.5} ¹	7.6	0.007	0.01	0.04
SO ₂	0.6	0.001	0.00	0.00
NO _x	-	0.068	0.08	0.36
CO	-	0.31	0.37	1.63
VOC	5.5	0.005	0.01	0.03

Note: Emission factors for NO_x and CO from AP-42, Section 13.5, Industrial Flares, Table 13.5-1, and calculated using the equation below:

$$NO_x \text{ and } CO, \frac{lb}{hr} = \left[HHV, \frac{Btu}{scf} \right] \times \left[\frac{scf}{hr} \right] \times \left[EF, \frac{lb}{MMBtu} \right] \times \left[\frac{MMBtu}{10^6 Btu} \right]$$

Emission factors for PM₁₀, PM_{2.5}, SO₂, and VOC from AP-42, Section 1.4, Natural Gas Combustion, Table 1.4-2, calculated using the equation below:

$$PM_{10}, PM_{2.5}, SO_2, \text{ or } VOC, \frac{lb}{hr} = \left[Total \text{ gas volume}, \frac{10^6 \text{ scf}}{hr} \right] \times \left[EF, \frac{lb}{10^6 \text{ scf}} \right] \times \frac{Produced \text{ Gas heating value} \left[\frac{btu}{scf} \right]}{Average \text{ NG heating value } (1,020) \left[\frac{btu}{scf} \right]}$$

¹ PM₁₀ and PM_{2.5} are assumed to equal total particulate matter.

Table B.17. - Crude Oil/Condensate Storage Tank Vapor Sent to Flare Hazardous Air Pollutant Emissions

Pollutant	Emission Factor, lb/10 ⁶ scf	Emission Rate, lb/hr	Emission Rate, tpy
2-Methylnaphthalene	2.40E-05	2.82E-08	1.23E-07
3-Methylchloranthrene	1.80E-06	2.11E-09	9.26E-09
7,12-Dimethylbenz(a)anthracene	1.60E-05	1.88E-08	8.23E-08
Acenaphthene	1.80E-06	2.11E-09	9.26E-09
Anthracene	2.40E-06	2.82E-09	1.23E-08
Benz(a)anthracene	1.80E-06	2.11E-09	9.26E-09
Benzene	2.10E-03	2.47E-06	1.08E-05
Benzo(a)pyrene	1.20E-06	1.41E-09	6.17E-09
Benzo(b)fluoranthene	1.80E-06	2.11E-09	9.26E-09
Benzo(g,h,i)perylene	1.20E-06	1.41E-09	6.17E-09
Benzo(k)fluoranthene	1.80E-06	2.11E-09	9.26E-09
Crysene	1.80E-06	2.11E-09	9.26E-09
Dibenzo(a,h)anthracene	1.20E-06	1.41E-09	6.17E-09
Dichlorobenzene	1.20E-03	1.41E-06	6.17E-06
Fluoranthene	3.00E-06	3.52E-09	1.54E-08
Fluorene	2.80E-06	3.29E-09	1.44E-08
Formaldehyde	7.50E-02	8.81E-05	3.86E-04
n-Hexane	1.80E+00	2.11E-03	9.26E-03
Indeno(1,2,3-cd)pyrene	1.80E-06	2.11E-09	9.26E-09
Naphthalene	6.10E-04	7.16E-07	3.14E-06
Phenanathrene	1.70E-05	2.00E-08	8.74E-08
Pyrene	5.00E-06	5.87E-09	2.57E-08
Toluene	3.40E-03	3.99E-06	1.75E-05
Total:		0.002	0.010

Note: Based on EPA AP-42, Section 1.4, Natural Gas Combustion (Table 1.4-3).

Table B.18. - Crude Oil/Condensate Storage Tank Vapor Sent to Flare Greenhouse Gas Emissions

Pollutant	Emission Factor, kg/MMBtu	Emission Factor, lb/MMBtu	Emissions, lb/hr	Emissions, tpy
CO ₂	53.06	116.98	140.12	613.71
CH ₄	1.00E-03	2.20E-03	2.64E-03	0.01
N ₂ O	1.00E-04	2.20E-04	2.64E-04	1.16E-03
Total CO₂e:			140.26	614.34

Note: Emission factors from 40 CFR Part 98 Subpart C, Table C-1 and C-2. Converted from kilograms to pounds. Global warming potentials for CH₄ and N₂O are 25 and 298, respectively.

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
Estimated Actual Annual Emissions Calculations
Crude Oil/Condensate Storage Tanks

Table B.19. - E&P Tank Modeling Results and Percent Total

Parameter	Uncontrolled Emissions			Controlled Emissions		
	E&P Tanks Model Results, tpy			E&P Tanks Model Results, tpy		
	Flashing	Working & Breathing	Total	Flashing	Working & Breathing	Total
Total Emissions	190.06	40.10	230.10	3.80	0.80	4.60
Emissions per Tank	19.01	4.01	23.01	0.38	0.08	0.46
Percent of Total	82.6%	17.4%	100%	82.6%	17.4%	100%

Note: Flashing and working & breathing losses are only provided for uncontrolled emissions in the E&P Tank model. These percentages of the total (83% for flashing emissions and 17% for working & breathing emissions) were used to estimate emissions for other pollutants (below, in Table B.20).

Table B.20. - Crude Oil/Condensate Storage Tank Emissions

Parameter	Uncontrolled Emissions				Controlled Emissions							
	E&P Tanks Model Results				E&P Tanks Model Results, tpy			Calculated Tank Vapor Combustion Emissions, tpy	Total Emissions		Emissions per Tank	
	Flashing	Working & Breathing	Total, lb/hr	Total, tpy	Flashing	Working & Breathing	Total, tpy		lb/hr	tpy	lb/hr	tpy
VOC	89.33	18.85	24.69	108.15	1.79	0.38	2.16	0.03	0.50	2.19	0.05	0.22
Total CO _{2e}	1,907.98	402.61	527.39	2,309.98	44.19	9.33	53.50	614.34	152.48	667.85	15.25	66.78
CH ₄	76.07	16.05	21.03	92.10	1.52	0.32	1.84	0.01	0.42	1.85	0.04	0.19
CO ₂	6.16	1.30	1.70	7.45	6.16	1.30	7.45	613.71	141.82	621.16	14.18	62.12
N ₂ O	-	-	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00
Total HAPs	3.69	0.78	1.02	4.47	0.07	0.02	0.09	0.01	0.02	0.10	0.00	0.01
Benzene	0.39	0.08	0.11	0.47	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.00
Toluene	0.32	0.07	0.09	0.39	0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.00
Ethylbenzene	0.01	0.00	0.00	0.01	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00
Xylene	0.09	0.02	0.02	0.10	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00
n-C6	2.88	0.61	0.80	3.49	0.06	0.01	0.07	0.01	0.02	0.08	0.00	0.01
2,2,4-Trimethylpentane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00
H ₂ S	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	0.00
PM ₁₀	-	-	-	-	-	-	-	0.04	0.01	0.04	0.00	0.00
PM _{2.5}	-	-	-	-	-	-	-	0.04	0.01	0.04	0.00	0.00
SO ₂	-	-	-	-	-	-	-	0.00	0.00	0.00	0.00	0.00
NO _x	-	-	-	-	-	-	-	0.36	0.08	0.36	0.01	0.04
CO	-	-	-	-	-	-	-	1.63	0.37	1.63	0.04	0.16

Note: Uncontrolled and controlled emissions from E&P Tank model run using oil analyses dated May, 2018, included in this appendix. Crude oil/condensate production is based on the daily production average for the first month of production, then multiplied by 365 to get the estimated annual PTE. Assumed 98% control efficiency for the flare. Flashing and working & breathing losses estimated for the pollutants above as a percentage of their total emissions (see Table B.19). For example, total uncontrolled flashing emissions was equal to 83% of total uncontrolled emissions. Therefore, for VOC, flashing emissions are 837% of total uncontrolled VOC emissions. Emissions in pounds per hour assumed to occur over 8,760 hours per year.

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
Estimated Actual Annual Emissions Calculations
Produced Water Tanks

Table B.21. - Produced Water Tanks Emissions

Pollutant	Uncontrolled Emissions		Controlled Emissions	
	lb/hr	tpy	lb/hr	tpy
VOC	0.04	0.17	7.84E-04	3.44E-03
Total CO ₂ e	0.46	2.00	0.07	0.31
CH ₄	0.02	0.07	3.14E-04	1.38E-03
CO ₂	0.06	0.28	0.06	0.28
Total HAPs	7.62E-04	3.34E-03	1.52E-05	6.67E-05
Benzene	7.98E-05	3.49E-04	1.60E-06	6.99E-06
Toluene	6.66E-05	2.92E-04	1.33E-06	5.84E-06
Ethylbenzene	2.39E-06	1.05E-05	4.77E-08	2.09E-07
Xylene	1.77E-05	7.76E-05	3.55E-07	1.55E-06
n-C6	5.94E-04	2.60E-03	1.19E-05	5.21E-05
2,2,4-Trimethylpentane	0.00	0.00	0.00	0.00
H ₂ S	0.00	0.00	0.00	0.00

Note: Produced water tank emissions from EPA TANKS modeling run. Speciated HAPs are assumed to have the same proportion of emissions (HAP to VOC) as the crude oil/ condensate storage tanks. Assumed 98% control efficiency for the flare. Emissions in pounds per hour assumed to occur over 8,760 hours per year.

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
Estimated Actual Annual Emissions Calculations
Steffes Engineered Flare Pilot

Table B.22. - Steffes Engineered Flare Pilot Information

Parameter	Value
Flare Pilot Usage, hours	8,760
Number of Flares	2
Flare Pilot Gas, scfm	0.18
Flare Pilot Gas Heating Value, Btu/scf	1,976.96
Total Gas Volume per Hour per Flare, 10 ⁶ scf/hr	0.00001
Flare Control Efficiency	98%

Note: Flare pilot gas conservatively assumed and gas heating value is weighted averaged from a produced gas analyses dated March 23, 2018.

Table B.23. - Steffes Engineered Flare Pilot Criteria Pollutant Emissions

Pollutant	Emission Factor, lb/10 ⁶ scf	Emission Factor, lb/MMBtu	Emissions, lb/hr	Emissions, tpy
PM ₁₀ ¹	7.6	0.007	3.24E-04	1.42E-03
PM _{2.5} ¹	7.6	0.007	3.24E-04	1.42E-03
SO ₂	0.6	0.001	2.56E-05	1.12E-04
NO _x	-	0.068	2.96E-03	1.30E-02
CO	-	0.31	0.01	5.91E-02
VOC	5.5	0.005	2.35E-04	1.03E-03

Note: Emission factors for NO_x and CO from AP-42, Section 13.5, Industrial Flares, Table 13.5-1, and calculated using the equation below:

$$NO_x \text{ and } CO, \frac{lb}{hr} = \left[HHV, \frac{Btu}{scf} \right] \times \left[\frac{scf}{hr} \right] \times \left[EF, \frac{lb}{MMBtu} \right] \times \left[\frac{MMBtu}{10^6 Btu} \right]$$

Emission factors for PM₁₀, PM_{2.5}, SO₂, and VOC from AP-42, Section 1.4, Natural Gas Combustion, Table 1.4-2, calculated using the equation below:

$$PM_{10}, PM_{2.5}, SO_2, \text{ or } VOC, \frac{lb}{hr} = \left[Total \text{ gas volume, } \frac{10^6 \text{ scf}}{hr} \right] \times \left[EF, \frac{lb}{10^6 \text{ scf}} \right] \times \frac{Produced \text{ Gas heating value } \left[\frac{btu}{scf} \right]}{Average \text{ NG heating value } (1,020) \left[\frac{btu}{scf} \right]}$$

¹ PM₁₀ and PM_{2.5} are assumed to equal total particulate matter.

Table B.24. - Steffes Engineered Flare Pilot Hazardous Air Pollutant Emissions

Pollutant	Emission Factor, lb/10 ⁶ scf	Emission Rate, lb/hr	Emission Rate, tpy
2-Methylnaphthalene	2.40E-05	1.02E-09	4.48E-09
3-Methylchloranthrene	1.80E-06	7.68E-11	3.36E-10
7,12-Dimethylbenz(a)anthracene	1.60E-05	6.82E-10	2.99E-09
Acenaphthene	1.80E-06	7.68E-11	3.36E-10
Anthracene	2.40E-06	1.02E-10	4.48E-10
Benz(a)anthracene	1.80E-06	7.68E-11	3.36E-10
Benzene	2.10E-03	8.95E-08	3.92E-07
Benzo(a)pyrene	1.20E-06	5.12E-11	2.24E-10
Benzo(b)fluoranthene	1.80E-06	7.68E-11	3.36E-10
Benzo(g,h,i)perylene	1.20E-06	5.12E-11	2.24E-10
Benzo(k)fluoranthene	1.80E-06	7.68E-11	3.36E-10
Crysene	1.80E-06	7.68E-11	3.36E-10
Dibenzo(a,h)anthracene	1.20E-06	5.12E-11	2.24E-10
Dichlorobenzene	1.20E-03	5.12E-08	2.24E-07
Fluoranthene	3.00E-06	1.28E-10	5.60E-10
Fluorene	2.80E-06	1.19E-10	5.23E-10
Formaldehyde	7.50E-02	3.20E-06	1.40E-05
n-Hexane	1.80E+00	7.68E-05	3.36E-04
Indeno(1,2,3-cd)pyrene	1.80E-06	7.68E-11	3.36E-10
Naphthalene	6.10E-04	2.60E-08	1.14E-07
Phenanathrene	1.70E-05	7.25E-10	3.17E-09
Pyrene	5.00E-06	2.13E-10	9.34E-10
Toluene	3.40E-03	1.45E-07	6.35E-07
Total:		8.03E-05	3.52E-04

Note: Based on EPA AP-42, Section 1.4, Natural Gas Combustion (Table 1.4-3).

Table B.25. - Steffes Engineered Flare Pilot Greenhouse Gas Emissions

Pollutant	Emission Factor, kg/MMBtu	Emission Factor, lb/MMBtu	Emissions, lb/hr	Emissions, tpy
CO ₂	53.06	116.98	5.09	22.28
CH ₄	1.00E-03	2.20E-03	9.59E-05	4.20E-04
N ₂ O	1.00E-04	2.20E-04	9.59E-06	4.20E-05
Total CO₂e:			5.09	22.30

Note: Emission factors from 40 CFR Part 98 Subpart C, Table C-1 and C-2. Converted from kilograms to pounds. Global warming potentials for CH₄ and N₂O are 25 and 298, respectively.

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
Estimated Actual Annual Emissions Calculations
Fugitive Leaks

Table B.26. - Fugitive Emissions: Emission Factors for Total Hydrocarbon (THC) Emissions

Equipment Type	Equipment Service Category, lb/hr/source			
	Gas	Heavy Oil (< 20° API)	Light Oil (>20° API)	Water/Light Oil
Valves	9.92E-03	1.85E-05	5.51E-03	2.16E-04
Pump Seals	5.29E-03	-	2.87E-02	5.29E-05
Others	1.94E-02	7.05E-05	1.65E-02	3.09E-02
Connectors	4.41E-04	1.65E-05	4.63E-04	2.43E-04
Flanges	8.60E-04	8.60E-07	2.43E-04	6.39E-06
Open-Ended Lines	4.41E-03	3.09E-04	3.09E-03	5.51E-04

Note: From US EPA Protocol for Equipment Leak Emission Estimates (EPA-453/R-95-017). Emission factors converted from kg/source-hr to lb/source-hr. The water/light oil emission factors apply to water streams in light oil service with water content between 50% and 99%. For streams with water content > 99%, the emission rate is considered negligible. The "other" equipment type includes compressor, pressure relief valves, diaphragms, drains, dump arms, hatches, instruments, meters, polished rods, and vents.

Table B.27. - Fugitive THC Emissions

Equipment Type	Number of Components	Service	Emission Factor, lb/hr/source	THC Emissions, lb/hr	THC Emissions, tpy
Valves	78	Gas	9.92E-03	0.77	3.39
Valves	78	Light Oil	5.51E-03	0.43	1.88
Valves	8	Water/Light Oil	2.16E-04	0.00	0.01
Pump Seals	0	Gas	5.29E-03	0.00	0.00
Pump Seals	0	Light Oil	2.87E-02	0.00	0.00
Pump Seals	0	Water/Light Oil	5.29E-05	0.00	0.00
Others	0	Gas	1.94E-02	0.00	0.00
Others	0	Light Oil	1.65E-02	0.00	0.00
Others	0	Water/Light Oil	3.09E-02	0.00	0.00
Connectors	672	Gas	4.41E-04	0.30	1.30
Connectors	354	Light Oil	4.63E-04	0.16	0.72
Connectors	52	Water/Light Oil	2.43E-04	0.01	0.06
Flanges	4	Gas	8.60E-04	0.00	0.02
Flanges	0	Light Oil	2.43E-04	0.00	0.00
Flanges	0	Water/Light Oil	6.39E-06	0.00	0.00
Open-Ended Lines	0	Gas	4.41E-03	0.00	0.00
Open-Ended Lines	0	Light Oil	3.09E-03	0.00	0.00
Open-Ended Lines	0	Water/Light Oil	5.51E-04	0.00	0.00
Total THC Emissions:				1.68	7.38

Note: Number of components estimated from actual counts performed at similar facilities.

Table B.28. - Speciated Fugitive Emission Factors

Pollutant	Weight Fraction	Weight Fraction	Weight Fraction	Emissions, lb/hr	Emissions, tpy
	Gas	Light Oil	Water/Light Oil		
THC	1.0000	1.0000	1.0000	1.68	7.37
VOC	0.6132	0.4886	0.4886	0.96	4.18
Total CO ₂ e	-	-	-	11.17	48.90
CH ₄	0.18	0.4206	0.4206	0.45	1.95
CO ₂	0.01	0.0275	0.0275	0.02	0.10
Total HAPs	0.026	0.0204	0.0204	0.04	0.17
Benzene	0.003	0.0021	0.0021	0.00	0.02
Toluene	0.002	0.0018	0.0018	0.00	0.02
Ethylbenzene	0.000	0.0001	0.0001	0.00	0.00
Xylenes	0.001	0.0005	0.0005	0.00	0.00
n-Hexane	0.020	0.0159	0.0159	0.03	0.14
2,2,4-Trimethylpentane	0.000	0.0000	0.0000	0.00	0.00
H ₂ S	0.000	0.0000	0.0000	0.00	0.00

Note: Water/Light Oil and Light Oil Weight fractions based on E&P Tank modeling run flashed gas results for the oil storage tanks. All stream weight fractions for organic compounds used in calculations are normalized based on 100% THC since EPA emission factors are based on THC emission rate. Produced Gas speciated HAPs are proportionally based on the speciated HAPs in the E&P TANK v2.0 flashed gas results, then normalized based on 100% THC.

Petroshale (US), Inc.

Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility

**Estimated Actual Annual Emissions Calculations
Truck Loading**

Table B.29. - Truck Loading Emissions Calculation Inputs - Produced Water Only

Parameter	Value
Saturation Factor (S)	0.6
True Vapor Pressure of Liquid Loaded (P), psia	0.24
Molecular Weight of Vapors (M), lb/lb-mole	20.68
Temperature of Bulk Liquid Loaded (T), °F	41.45
Loading Losses, lb/1,000 gallons	0.08
Water Production, BPD	1,159.3
Average Water Loadout Rate, gallons/hr	2,028.8
Maximum Water Loadout Rate, gallons/hr	7,560.0
Maximum Yearly Throughput, gallons/yr	17,772,586

Note: Loading losses based on EPA AP-42 Section 5.2-4:

$$L_L = 12.46 \frac{SPM}{(T + 460)}$$

Saturation factor based on submerged loading; dedicated normal service. Molecular weight of vapors and liquid bulk temperature from EPA Tank run. TVP of liquid loaded is assumed to be the maximum vapor pressure from hottest month (July) to be conservative.

Table B.30. - Truck Loading Emissions in Tons Per Year

Pollutant	Weight Fraction	Produced Water Loading, tpy	
		lb/hr	tpy
THC	0.9431	0.53	0.63
VOC	0.4628	0.26	0.31
Total CO ₂ e	-	4.30	5.05
CH ₄	0.3009	0.17	0.20
CO ₂	0.0555	0.03	0.04
Total HAPs	0.0180	0.01	0.01
Benzene	0.0019	0.00	0.00
Toluene	0.0016	0.00	0.00
Ethylbenzene	0.0001	0.00	0.00
Xylenes	0.0004	0.00	0.00
n-Hexane	0.0140	0.01	0.01
2,2,4-Trimethylpentane	0.0000	0.00	0.00
H ₂ S	0.0000	0.00	0.00

Note: Weight fractions based on E&P Tank modeling run working and breathing gas composition for the crude oil/condensate storage tanks, which is included in this appendix. Truck loading emissions in lb/hr use maximum loadout rate. Note that crude oil/condensate is removed from site via pipeline so no loading emissions for crude oil/condensate are calculated.

Estimated Actual Annual Emissions Calculations

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
PTE Emission Calculations
Generator Engine

Table B.31. - Engine Information

Parameter	Value
Maximum Stand-By Power (kW) ¹	604
Maximum Stand-By Power (hp) ¹	810
Number of Units	1
Fuel	Diesel
Annual Hours of Operation per Unit (hr)	8,760
Diesel Fuel Heating Value (Btu/lb)	19,300
Estimated Heat Input (MMBtu/hr)	5.00
Fuel Flow (gallons/hr) ¹	36.50
Fuel Flow (lb/hr)	259.15
Density of Fuel (lb/gallon)	7.10
Annual Fuel Consumption (MMBtu/year)	43,813.97

¹ Values from engine manufacturer's specifications.

Table B.32. - Uncontrolled Generator Engine Emissions

Component	AP-42 Emission Factor ¹		EPA Tier 2 Emission Factor ²			Uncontrolled Emission Rate	
	lb/MMBtu	lb/bhp-hr	g/kW-hr	g/bhp-hr	lb/bhp-hr	lb/hr	tons/year
NO _x	4.41	0.03	5.92	4.41	9.73E-03	7.88	34.51
NMHC+NO _x	-	-	6.40	4.77	1.05E-02	-	-
CO	0.95	0.01	3.50	2.61	5.75E-03	4.66	20.41
VOCs	0.36	2.51E-03	0.48	0.36	7.94E-04	0.64	2.82
Formaldehyde	1.18E-03	7.29E-06	1.40E-03	1.04E-03	2.30E-06	1.86E-03	0.01
PM _{2.5}	-	-	0.20	0.15	3.29E-04	0.27	1.17
PM ₁₀	0.31	2.20E-03	0.20	0.15	3.29E-04	0.27	1.17
PM	-	-	0.20	0.15	3.29E-04	0.27	1.17
SO ₂	0.29	2.05E-03	-	-	-	1.66	7.27
CH ₄	6.61E-03	-	-	-	-	0.03	0.14
N ₂ O	1.32E-03	-	-	-	-	0.01	0.03
CO ₂	164.00	1.15	-	-	-	931.50	4,079.97
CO ₂ e ³	164.00	1.15	-	-	-	934.30	4,092.23

¹ Emission factors for CH₄ and N₂O from 40 CFR Part 98 Subpart C, Table C-1 and C-2, converted from kilograms to pounds. All other emission factors from AP-42 Chapter 3 Section 3 – *Gasoline and Diesel Industrial Engines*, Table 3.3-1 - Emission Factors for Uncontrolled Gasoline and Diesel Industrial Engines, dated October 1996.

² Engine will be compliant with the EPA exhaust emission standards for nonroad compression-ignition engines applicable to its model year available online at: <https://nepis.epa.gov/Exec/zyPDF.cgi?Dockey=P1000A05.pdf>. EPA Tier 2 final emission rates (g/kW-hr) are used as the basis for emission calculations of NO_x, CO, VOC, PM, and HAPs since the genset is EPA Tier 2 certified according to manufacturer information. It is assumed that PM = PM₁₀ = PM_{2.5}. Engine emissions of NO_x are determined based on the Tier 2 emission rate (g/kW-hr) for Non-Methane-Hydrocarbon + NO_x emission factor and then the NO_x emissions alone are determined based on the ratio of the AP-42 factors of NO_x and VOC to establish a NO_x-specific emission factor from the Tier 2 emission rate. Tier 2 VOC-specific emission factor is determined in the same manner. It is conservatively assumed that the "NMHC" emissions are equivalent to VOC emissions. The formaldehyde emission factor is based on the Tier 2 VOC-specific emission factor and the ratio of AP-42 emission factor for formaldehyde to the AP-42 emission factor for VOC. See example calculations below:

$$\text{Tier 2 NO}_x \text{ EF} = \text{Tier 2 NMHC} + \text{NO}_x \text{ EF} \times \frac{\text{AP} - 42 \text{ NO}_x \text{ EF}}{(\text{AP} - 42 \text{ VOC EF} + \text{AP} - 42 \text{ NO}_x \text{ EF})}$$

$$\text{Tier 2 CH}_2\text{O EF} = \text{Tier 2 VOC EF} \times \frac{\text{AP} - 42 \text{ EF CH}_2\text{O}_2}{\text{AP} - 42 \text{ EF VOC}}$$

Table B.33. - Controlled Generator Engine Emissions

Component	Specs Emission Factor ¹		Controlled Emission Rate	
	g/kw-hr	g/bhp-hr	lb/hr	tons/year
NO _x	5.18	3.87	6.90	30.22
NMHC+NO _x	-	-	-	-
CO	0.69	0.51	0.92	4.02
VOCs	0.16	0.12	0.21	0.93
Formaldehyde	4.64E-04	3.46E-04	6.17E-04	2.70E-03
PM _{2.5}	0.11	0.08	0.15	0.65
PM ₁₀	0.11	0.08	0.15	0.65
PM	0.11	0.08	0.15	0.65
SO ₂	-	0.93	1.66	7.27
CH ₄	-	-	0.03	0.14
N ₂ O	-	-	0.01	0.03
CO ₂	699.54	521.63	931.50	4,079.97
CO ₂ e ²	699.54	521.63	934.30	4,092.23

¹ The emission factors for CO, NO_x, and VOC, and PM are based on the manufacturer's specifications. It is assumed PM = PM₁₀ = PM_{2.5}. SO₂ and CO₂ emission factors from AP-42 Chapter 3 Section 3 – *Gasoline and Diesel Industrial Engines*, Table 3.3-1 - Emission Factors for Uncontrolled Gasoline and Diesel Industrial Engines, dated October 1996. Emission factors for CH₄ and N₂O from 40 CFR Part 98 Subpart C, Table C-1 and C-2, converted from kilograms to pounds. The formaldehyde emission factor is based on the VOC emission factor and the ratio of AP-42 emission factor for formaldehyde to the AP-42 emission factor for VOC.

$$\text{Manufacturer's Spec CH}_2\text{O EF} = \text{Manufacturer's Spec VOC EF} \times \frac{\text{AP} - 42 \text{ CH}_2\text{O EF}}{\text{AP} - 42 \text{ VOC EF}}$$

² Global warming potentials obtained from Table A-1 to Subpart 98 - Global Warming

Potentials Equation A-1: CO₂e = ΣGHGi x GWPI

Where:

CO₂e = Carbon dioxide equivalent (tons/year)

GHGi = Mass emissions of each GHG (tons/year)

GWPI = Global warming potential for each GHG (1 for CO₂; 25 for CH₄; 298 for N₂O)

Estimated Actual Annual Emissions Calculations

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
PTE Emission Calculations
Generator Engine

³ Global warming potentials obtained from Table A-1 to Subpart 98 - Global Warming Potentials Equation A-1: CO₂e = ΣGHGi x GWPI

Where:

CO₂e = Carbon dioxide equivalent (tons/year)

GHGi = Mass emissions of each GHG (tons/year)

GWPI = Global warming potential for each GHG (1 for CO₂; 25 for CH₄; 298 for N₂O)

Table B.34. - Generator Engine HAP Emissions

Component	AP-42 Emission Factor ¹		EPA Tier 2 Emission Factor ²		Uncontrolled Emission Rate		Specs Emission Factor ²		Controlled Emission Rate	
	lb/MMBtu	lb/bhp-hr	g/kW-hr	g/bhp-hr	lb/hr	tons/year	g/kW-hr	g/bhp-hr	lb/hr	tons/year
1,3-Butadiene	3.91E-05	2.41E-07	4.64E-05	3.46E-05	6.18E-05	2.71E-04	1.54E-05	1.15E-05	2.05E-05	8.96E-05
Acenaphthene	1.42E-06	8.77E-09	1.68E-06	1.26E-06	2.24E-06	9.83E-06	5.58E-07	4.16E-07	7.43E-07	3.26E-06
Acenaphthylene	5.06E-06	3.12E-08	6.00E-06	4.48E-06	7.99E-06	3.50E-05	1.99E-06	1.48E-06	2.65E-06	1.16E-05
Acetaldehyde	7.67E-04	4.74E-06	9.10E-04	6.79E-04	1.21E-03	5.31E-03	3.01E-04	2.25E-04	4.01E-04	1.76E-03
Acrolein	9.25E-05	5.71E-07	1.10E-04	8.18E-05	1.46E-04	6.40E-04	3.63E-05	2.71E-05	4.84E-05	2.12E-04
Anthracene	1.87E-06	1.15E-08	2.22E-06	1.65E-06	2.95E-06	1.29E-05	7.35E-07	5.48E-07	9.79E-07	4.29E-06
Benzene	9.33E-04	5.76E-06	1.11E-03	8.25E-04	1.47E-03	6.46E-03	3.67E-04	2.73E-04	4.88E-04	2.14E-03
Benzo(a)anthracene	1.68E-06	1.04E-08	1.99E-06	1.49E-06	2.65E-06	1.16E-05	6.60E-07	4.92E-07	8.79E-07	3.85E-06
Benzo(b)fluoranthene	9.91E-08	6.12E-10	1.18E-07	8.77E-08	1.57E-07	6.86E-07	3.89E-08	2.90E-08	5.19E-08	2.27E-07
Benzo(k)fluoranthene	1.55E-07	9.57E-10	1.84E-07	1.37E-07	2.45E-07	1.07E-06	6.09E-08	4.54E-08	8.11E-08	3.55E-07
Benzo(a)pyrene	1.88E-07	1.16E-09	2.23E-07	1.66E-07	2.97E-07	1.30E-06	7.39E-08	5.51E-08	9.84E-08	4.31E-07
Benzo(g,h,i)perylene	4.89E-07	3.02E-09	5.80E-07	4.33E-07	7.72E-07	3.38E-06	1.92E-07	1.43E-07	2.56E-07	1.12E-06
Chrysene	3.53E-07	2.18E-09	4.19E-07	3.12E-07	5.58E-07	2.44E-06	1.39E-07	1.03E-07	1.85E-07	8.09E-07
Dibenz(a,h)anthracene	5.83E-07	3.60E-09	6.92E-07	5.16E-07	9.21E-07	4.03E-06	2.29E-07	1.71E-07	3.05E-07	1.34E-06
Fluoranthene	7.61E-06	4.70E-08	9.03E-06	6.73E-06	1.20E-05	5.27E-05	2.99E-06	2.23E-06	3.98E-06	1.74E-05
Fluorene	2.92E-05	1.80E-07	3.46E-05	2.58E-05	4.61E-05	2.02E-04	1.15E-05	8.56E-06	1.53E-05	6.69E-05
Indeno(1,2,3-cd)pyrene	3.75E-07	2.32E-09	4.45E-07	3.32E-07	5.92E-07	2.59E-06	1.47E-07	1.10E-07	1.96E-07	8.60E-07
Naphthalene	8.48E-05	5.24E-07	1.01E-04	7.50E-05	1.34E-04	5.87E-04	3.33E-05	2.49E-05	4.44E-05	1.94E-04
Phenanthrene	2.94E-05	1.82E-07	3.49E-05	2.60E-05	4.64E-05	2.03E-04	1.16E-05	8.62E-06	1.54E-05	6.74E-05
Pyrene	4.78E-06	2.95E-08	5.67E-06	4.23E-06	7.55E-06	3.31E-05	1.88E-06	1.40E-06	2.50E-06	1.10E-05
Toluene	4.09E-04	2.53E-06	4.85E-04	3.62E-04	6.46E-04	2.83E-03	1.61E-04	1.20E-04	2.14E-04	9.38E-04
Xylene	2.85E-04	1.76E-06	3.38E-04	2.52E-04	4.50E-04	1.97E-03	1.12E-04	8.35E-05	1.49E-04	6.53E-04
Total HAPs³	3.87E-03	2.39E-05	4.60E-03	3.43E-03	6.12E-03	2.68E-02	1.52E-03	1.14E-03	2.03E-03	8.88E-03

¹ Emission factors from AP-42 Chapter 3 Section 3 – Gasoline and Diesel Industrial Engines, Table 3.3-2 - Speciated Organic Compound Emission Factors for Uncontrolled Diesel Engines, dated October 1996.

² Tier 2 individual HAP emission factor is based on the Tier 2 VOC-specific emission factor and the ratio of the AP-42 individual HAP emission factor to the AP-42 emission factor for VOC. Manufacturer's specification individual HAP emission factor is determined in the same manner. See example calculations below:

$$\text{Tier 2 individual HAP EF} = \text{Tier 2 VOC EF} \times \frac{\text{AP} - 42 \text{ individual HAP EF}}{\text{AP} - 42 \text{ VOC EF}}$$

$$\text{Manufacturer's Spec individual HAP EF} = \text{Manufacturer's Spec VOC EF} \times \frac{\text{AP} - 42 \text{ individual HAP EF}}{\text{AP} - 42 \text{ VOC EF}}$$

³ Total HAPs emissions include formaldehyde emissions from Tables B.32 and B.33.

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
Estimated Actual Annual Emissions Calculations
Produced Gas

Table B.35. - Produced Gas Sent to Flare Information

Parameter	Value
Produced Gas Volume, MCFD	307.94
Produced Gas Volume, scf/hr	12,830.73
Produced Gas Heating Value, Btu/scf	1,976.96
Total Gas Volume per Hour, 10 ⁶ scf/hr	0.01

Note: The well is connected to a gas sales pipeline, however data of flared gas volumes from each well are conservatively used. Heating value based on gas analyses dated March 23, 2018 (included in this appendix).

Table B.36. - Produced Gas Sent to Flare Criteria Pollutant Emissions

Pollutant	Emission Factor, lb/10 ⁶ scf	Emission Factor, lb/MMBtu	Emissions, lb/hr	Emissions, tpy
PM ₁₀ ¹	7.6	0.007	0.19	0.83
PM _{2.5} ¹	7.6	0.007	0.19	0.83
SO ₂	0.6	0.001	0.01	0.07
NO _x	-	0.068	1.72	7.55
CO	-	0.31	7.86	34.44
VOC	5.5	0.005	0.14	0.60

Note: SO₂ and VOC emissions are calculated using fuel in Table B.36. Emission factors for NO_x and CO from AP-42, Section 13.5, Industrial Flares, Table 13.5-1, and calculated using the equation below:

$$NO_x \text{ and } CO, \frac{lb}{hr} = \left[HHV, \frac{Btu}{scf} \right] \times \left[\frac{scf}{hr} \right] \times \left[EF, \frac{lb}{MMBtu} \right] \times \left[\frac{MMBtu}{10^6 Btu} \right]$$

Emission factors for PM₁₀, PM_{2.5}, VOC, and SO₂ from AP-42, Section 1.4, Natural Gas Combustion, Table 1.4-2, calculated using the equation below:

$$PM_{10}, PM_{2.5}, \frac{lb}{hr} = \left[Total \text{ gas volume}, \frac{10^6 \text{ scf}}{hr} \right] \times \left[EF, \frac{lb}{10^6 \text{ scf}} \right] \times \frac{Produced \text{ Gas heating value} \left[\frac{btu}{scf} \right]}{Average \text{ NG heating value } (1,020) \left[\frac{btu}{scf} \right]}$$

¹ PM₁₀ and PM_{2.5} are assumed to equal total particulate matter.

Table B.37. - Produced Gas Sent to Flare Hazardous Air Pollutant Emissions

Pollutant	Emission Factor, lb/10 ⁶ scf	Emission Rate, lb/hr	Emission Rate, tpy
2-Methylnaphthalene	2.40E-05	5.97E-07	2.61E-06
3-Methylchloranthrene	1.80E-06	4.48E-08	1.96E-07
7,12-Dimethylbenz(a)anthracene	1.60E-05	3.98E-07	1.74E-06
Acenaphthene	1.80E-06	4.48E-08	1.96E-07
Anthracene	2.40E-06	5.97E-08	2.61E-07
Benz(a)anthracene	1.80E-06	4.48E-08	1.96E-07
Benzene	2.10E-03	5.22E-05	2.29E-04
Benzo(a)pyrene	1.20E-06	2.98E-08	1.31E-07
Benzo(b)fluoranthene	1.80E-06	4.48E-08	1.96E-07
Benzo(g,h,i)perylene	1.20E-06	2.98E-08	1.31E-07
Benzo(k)fluoranthene	1.80E-06	4.48E-08	1.96E-07
Crysene	1.80E-06	4.48E-08	1.96E-07
Dibenzo(a,h)anthracene	1.20E-06	2.98E-08	1.31E-07
Dichlorobenzene	1.20E-03	2.98E-05	1.31E-04
Fluoranthene	3.00E-06	7.46E-08	3.27E-07
Fluorene	2.80E-06	6.96E-08	3.05E-07
Formaldehyde	7.50E-02	1.87E-03	8.17E-03
n-Hexane	1.80E+00	4.48E-02	1.96E-01
Indeno(1,2,3-cd)pyrene	1.80E-06	4.48E-08	1.96E-07
Naphthalene	6.10E-04	1.52E-05	6.64E-05
Phenanthrene	1.70E-05	4.23E-07	1.85E-06
Pyrene	5.00E-06	1.24E-07	5.45E-07
Toluene	3.40E-03	8.46E-05	3.70E-04
Total:		0.047	0.205

Note: Based on EPA AP-42, Section 1.4, Natural Gas Combustion (Table 1.4-3).

Table B.38. - Produced Gas Sent to Flare Greenhouse Gas Emissions

Pollutant	Emission Factor, kg/MMBtu	Emission Factor, lb/MMBtu	Emissions, lb/hr	Emissions, tpy
CO ₂	53.06	116.98	2,967.22	12,996.43
CH ₄	1.00E-03	2.20E-03	0.06	0.24
N ₂ O	1.00E-04	2.20E-04	0.01	0.02
Total CO₂e:			2,970.29	13,009.85

Note: Emission factors from 40 CFR Part 98 Subpart C, Table C-1 and C-2. Converted from kilograms to pounds. Global warming potentials for CH₄ and N₂O are 25 and 298, respectively.

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
Estimated Actual Annual Emissions Calculations
Produced Gas

Table B.39. - Flare and Produced Gas Information

Parameter	Value
Flare Destruction Efficiency, %	98
Molecular Weight of Produced Gas, lb/lb-mole	34.07
HHV of Produced Gas, Btu/scf	1,976.96
Volume of Produced Gas to Flare, MCFD	307.94
Volume of Produced Gas to Flare, scf/hr	12,830.73

Note: Produced gas sent to engineered flare. Flared volumes based on production data. Heating value based on gas analyses dated March 23, 2018 (included in this appendix).

Table B.40. - Uncontrolled and Controlled Produced Gas Emissions

Pollutant	Gas Analysis Data		Uncontrolled		Controlled		Calculated Combustion Emissions, tpy	Total Controlled Emissions	
	Weight Percent	Mole Percent	lb/hr	tpy	lb/hr	tpy		lb/hr	tpy
VOC	60.53	-	698.13	3,057.79	13.96	61.16	0.60	14.10	61.76
Total CO ₂ e	-	-	5,108.24	22,374.09	109.08	477.77	13,009.85	3,079.36	13,487.62
CH ₄	17.69	-	204.05	893.73	4.08	17.87	0.24	4.14	18.12
CO ₂	0.61	-	7.06	30.90	7.06	30.90	12,996.43	2,974.28	13,027.33
N ₂ O	-	-	-	-	-	-	0.02	0.01	0.02
Total HAPs	2.52	-	29.11	127.48	0.58	2.55	0.21	0.63	2.75
Benzene	0.26	-	3.05	13.35	0.06	0.27	0.00	0.06	0.27
Toluene	0.22	-	2.56	11.19	0.05	0.22	0.00	0.05	0.22
Ethylbenzene	0.01	-	0.09	0.39	0.00	0.01	-	0.00	0.01
Xylene	0.06	-	0.68	2.99	0.01	0.06	-	0.01	0.06
n-C6	1.97	-	22.73	99.56	0.45	1.99	0.20	0.50	2.19
2,2,4-Trimethylpentane	0.00	-	0.00	0.00	0.00	0.00	-	0.00	0.00
H ₂ S	0.00	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PM ₁₀	-	-	-	-	-	-	0.83	0.19	0.83
PM _{2.5}	-	-	-	-	-	-	0.83	0.19	0.83
SO ₂	-	-	-	-	-	-	0.07	0.02	0.07
NO _x	-	-	-	-	-	-	7.55	1.72	7.55
CO	-	-	-	-	-	-	34.44	7.86	34.44

Note: Speciated HAPs are proportionally based on the speciated HAPs in the E&P TANK v2.0 flashed gas results. Emission factors for NO_x and CO from AP-42, Chapter 13.5, Industrial Flares, Table 13.5-1. Emissions in tons per year assume flaring 8,760 hours per year. Uncontrolled emissions for VOC, HAPs, and H₂S were calculated using the following equation:

$$VOC, HAPs, \text{ and } H_2S \text{ uncontrolled emission rate, } \frac{lb}{hr} = \text{Molecular weight, } \frac{lb}{lb\text{-mole}} \times \frac{1 \text{ lb-mole}}{379 \text{ scf}} \times \text{Volume of gas, } \frac{scf}{hr} \times \text{Weight Percent}$$

Petroshale (US), Inc.
Horse Camp 2-11H and 101-11H and Horse Camp West 2MBH and 2TFH Production Facility
Estimated Actual Annual Emissions Calculations
Produced Gas Composition

Compositional Analysis			4-11H Produced Gas			104-11H Produced Gas			Weighted Avg. Produced Gas		
Species	Formula	MW	Mol Percent	Weight Percent	Molecular Weight Contribution	Mol Percent	Weight Percent	Molecular Weight Contribution	Mol Percent	Weight Percent	Molecular Weight Contribution
Nitrogen	N ₂	28.01	0.95	0.79	0.266	0.57	0.46	0.160	0.82	0.67	0.229
Methane	CH ₄	16.04	38.89	18.57	6.238	35.17	16.14	5.641	37.58	17.69	6.027
Carbon Dioxide	CO ₂	44.01	0.47	0.62	0.207	0.48	0.60	0.211	0.47	0.61	0.208
Ethane	C ₂ H ₆	30.07	22.84	20.45	6.868	23.92	20.58	7.193	23.22	20.50	6.983
Hydrogen Sulfide	H ₂ S	34.8	0.00	0.00	0.000	0.00	0.00	0.000	0.00	0.00	0.000
Propane	C ₃ H ₈	44.1	19.56	25.68	8.626	21.07	26.59	9.292	20.09	26.01	8.861
i-Butane	C ₄ H ₁₀	58.12	2.30	3.98	1.337	2.47	4.11	1.436	2.36	4.03	1.372
n-Butane	C ₄ H ₁₀	58.12	8.21	14.21	4.772	8.77	14.59	5.097	8.41	14.34	4.887
i-Pentane	C ₅ H ₁₂	71.99	1.54	3.30	1.109	1.61	3.32	1.159	1.56	3.31	1.126
n-Pentane	C ₅ H ₁₂	71.99	2.46	5.27	1.771	2.54	5.23	1.829	2.49	5.26	1.791
Hexanes +	C ₆ +	86.18	2.78	7.13	2.396	3.40	8.38	2.930	3.00	7.59	2.584
Oxygen	O ₂	32	0.00	0.00	0.000	0.00	0.00	0.000	0.00	0.00	0.000
			100	100	33.589	100	100	34.947	100	100	34.068
HHV (BTU/scf)			1,948.00	-	-	2,030.00	-	-	1,976.96	-	-

Note: it was assumed that the 4-11H produced gas analysis represented the gas produced by the Horse Camp West 2MBH and Horse Camp 2-11H wells and the 104-11H gas analysis represented the gas produced by the Horse Camp West 2TFH and Horse Camp 1-11H wells.

Condensate Properties		
4-11H API Gravity	104-11H API Gravity	Weighted Avg API Gravity
39.6	40.4	39.88

Estimated Actual Annual Emissions Calculations

E&P Tank Runs

Entire Facility Combined

Production Rate (bbl/day)	905.10	
Uncontrolled Emission Summary	ton	
Total HAPs	4.470	0.456
Total HC	221.433	22.638
NMHC, C2+	129.333	13.222
NMNEHC, C3+	108.147	11.057
CO2	7.454	16.282
CH4	92.101	9.416

Uncontrolled Recovery Information

Vapor(mscfd):	17.6400
HC Vapor(mscfd):	17.1800
CO2(mscfd):	0.00
CH4(mscfd):	0.00
GOR(SCF/STB):	19.49

Component	Uncontrolled Controlled	
	ton	ton
H2S	0.0000	0.0000
O2	0.0000	0.0000
CO2	7.4540	7.4540
N2	1.2140	1.2140
C1	92.1010	3.7970
C2	21.1870	0.8730
C3	28.9100	1.1920
i-C4	18.0800	0.7460
n-C4	19.7150	0.8130
i-C5	13.3790	0.5510
n-C5	10.5350	0.4350
C6	5.5300	0.2290
Benzene	0.4680	0.0190
Toluene	0.3910	0.0160
E-Benzene	0.0140	0.0000
Xylenes	0.1040	0.0030
n-C6	3.4870	0.1430
224Trimethylp	0.0000	0.0000
C7	4.8600	0.2010
C8	2.1210	0.0880
C9	0.5500	0.0240
C10+	0.0000	0.0000
	0.0000	0.0000
Total	230.1000	17.7980

Component	MW lb/lbmol	LP Oil mole%	Flash Oil mole%	Sales Oil mole%	Flash Gas mole%	W&S Gas mole%	Total mole%
H2S	34.80	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
O2	32.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CO2	44.01	0.0800	0.0260	0.0019	1.6687	3.7141	1.9960
N2	28.01	0.0200	0.0009	0.0000	0.5806	0.1431	0.5106

Estimated Actual Annual Emissions Calculations

E&P Tank Runs

Entire Facility Combined

C1	16.04	2.6500	0.3584	0.0006	70.0127	55.2139	67.6445
C2	30.07	0.3900	0.1808	0.0675	6.5394	17.5551	8.3023
C3	44.10	0.9200	0.6987	0.6426	7.4245	9.3012	7.7249
i-C4	58.12	0.9800	0.8895	0.8705	3.6407	3.7936	3.6652
n-C4	58.12	1.4700	1.3846	1.3670	3.9809	4.0791	3.9966
i-C5	72.15	2.0500	2.0455	2.0445	2.1818	2.2002	2.1848
n-C5	72.15	2.1600	2.1750	2.1779	1.7185	1.7306	1.7205
C6	84.00	3.4500	3.5410	3.5590	0.7751	0.7794	0.7758
Benzene	78.11	0.4300	0.4422	0.4447	0.0705	0.0709	0.0705
Toluene	92.14	1.1000	1.1357	1.1428	0.0501	0.0505	0.0502
E-Benzene	106.17	0.1000	0.1034	0.1040	0.0015	0.0015	0.0015
Xylenes	106.17	0.9000	0.9302	0.9362	0.0116	0.0117	0.0116
n-C6	86.18	2.7200	2.7963	2.8114	0.4764	0.4791	0.4768
224Trimethylp	114.24	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C7	100.20	7.9400	8.1900	8.2396	0.5898	0.5935	0.5904
C8	114.23	9.6900	10.0120	10.0758	0.2250	0.2267	0.2252
C9	128.28	6.5600	6.7814	6.8253	0.0521	0.0557	0.0527
C10+	301.00	56.3900	58.3083	58.6887	0.0000	0.0000	0.0000
		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

	LP Oil	Flash Oil	Sales Oil	Flash Gas	W&S Gas	Total Emission
MW (lb/lbmol):	209.36	215.58	216.79	26.68	29.40	27.11
Stream Mole Ratio:	1.00	0.97	0.96	0.03	0.01	0.04
Stream Weight Ratio:	209.36	208.49	208.29	0.88	0.19	1.06
Total Emission (ton):				190.057	40.104	230.100
Heating Value (BTU/scf):				1,526.60	1,629.68	1,543.10
Gas Gravity (Gas/Air):				0.92	1.01	0.94
Bubble Pt. @100°F	97.56	18.02	5.25			
RVP @100°F (psia)	13.38	5.45	3.98			
Spec. Gravity @100°F	0.724	0.726	0.726			

Estimated Actual Annual Emissions Calculations

E&P Tank Runs

Horse Camp West 2MBH

Horse Camp West 2TFH

Production Rate (bbl/day)	588.9		210.3	
Uncontrolled Emission Summary	ton		ton	
Total HAPs	2.900	0.145	1.040	0.021
Total HC	144.063	7.203	51.454	1.029
NMHC, C2+	84.143	4.207	30.053	0.601
NMNEHC, C3+	70.359	3.518	25.130	0.503
CO2	4.850	4.85	1.732	1.7320
CH4	59.920	2.996	21.401	0.4280

Uncontrolled Recovery Information

Vapor(mscfd):	11.4700		4.1000	
HC Vapor(mscfd):	11.1800		3.9900	
CO2(mscfd):				
CH4(mscfd):				
GOR(SCF/STB):	19.48		19.49	

Component	Uncontrolled Controlled		Uncontrolled Controlled	
	ton	ton	ton	ton
H2S	0.0000	0.0000	0.0000	0.0000
O2	0.0000	0.0000	0.0000	0.0000
CO2	4.8500	4.8500	1.7320	1.7320
N2	0.7900	0.7900	0.2820	0.2820
C1	59.9200	2.9960	21.4010	0.4280
C2	13.7840	0.6890	4.9230	0.0980
C3	18.8080	0.9400	6.7180	0.1340
i-C4	11.7630	0.5880	4.2010	0.0840
n-C4	12.8260	0.6410	4.5810	0.0920
i-C5	8.7040	0.4350	3.1090	0.0620
n-C5	6.8540	0.3430	2.4480	0.0490
C6	3.5980	0.1800	1.2850	0.0260
Benzene	0.3040	0.0150	0.1090	0.0020
Toluene	0.2550	0.0130	0.0910	0.0020
E-Benzene	0.0090	0.0000	0.0030	0.0000
Xylenes	0.0680	0.0030	0.0240	0.0000
n-C6	2.2690	0.1130	0.8100	0.0160
224Trimethylp	0.0000	0.0000	0.0000	0.0000
C7	3.1620	0.1580	1.1290	0.0230
C8	1.3800	0.0690	0.4930	0.0100
C9	0.3580	0.0180	0.1280	0.0030
C10+	0.0000	0.0000	0.0000	0.0000

Estimated Actual Annual Emissions Calculations

E&P Tank Runs

Horse Camp West 2MBH

Horse Camp West 2TFH

Component	Horse Camp West 2MBH						Horse Camp West 2TFH					
	LP Oil mole%	Flash Oil mole%	Sales Oil mole%	Flash Gas mole%	W&S Gas mole%	Total mole%	LP Oil mole%	Flash Oil mole%	Sales Oil mole%	Flash Gas mole%	W&S Gas mole%	Total mole%
Total	149.7020	12.8410	0.0000				53.4670	3.0430	0.0000			
H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
O2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CO2	0.0800	0.0260	0.0019	1.6687	3.7141	1.9960	0.0800	0.0260	0.0019	1.6687	3.7141	1.9960
N2	0.0200	0.0009	0.0000	0.5806	0.1431	0.5106	0.0200	0.0009	0.0000	0.5806	0.1431	0.5106
C1	2.6500	0.3584	0.0006	70.0127	55.2139	67.6445	2.6500	0.3584	0.0006	70.0127	55.2139	67.6445
C2	0.3900	0.1808	0.0675	6.5394	17.5551	8.3023	0.3900	0.1808	0.0675	6.5394	17.5551	8.3023
C3	0.9200	0.6987	0.6426	7.4245	9.3012	7.7249	0.9200	0.6987	0.6426	7.4245	9.3012	7.7249
i-C4	0.9800	0.8895	0.8705	3.6407	3.7936	3.6652	0.9800	0.8895	0.8705	3.6407	3.7936	3.6652
n-C4	1.4700	1.3846	1.3670	3.9809	4.0791	3.9966	1.4700	1.3846	1.3670	3.9809	4.0791	3.9966
i-C5	2.0500	2.0455	2.0445	2.1818	2.2002	2.1848	2.0500	2.0455	2.0445	2.1818	2.2002	2.1848
n-C5	2.1600	2.1750	2.1779	1.7185	1.7306	1.7205	2.1600	2.1750	2.1779	1.7185	1.7306	1.7205
C6	3.4500	3.5410	3.5590	0.7751	0.7794	0.7758	3.4500	3.5410	3.5590	0.7751	0.7794	0.7758
Benzene	0.4300	0.4422	0.4447	0.0705	0.0709	0.0705	0.4300	0.4422	0.4447	0.0705	0.0709	0.0705
Toluene	1.1000	1.1357	1.1428	0.0501	0.0505	0.0502	1.1000	1.1357	1.1428	0.0501	0.0505	0.0502
E-Benzene	0.1000	0.1034	0.1040	0.0015	0.0015	0.0015	0.1000	0.1034	0.1040	0.0015	0.0015	0.0015
Xylenes	0.9000	0.9302	0.9362	0.0116	0.0117	0.0116	0.9000	0.9302	0.9362	0.0116	0.0117	0.0116
n-C6	2.7200	2.7963	2.8114	0.4764	0.4791	0.4768	2.7200	2.7963	2.8114	0.4764	0.4791	0.4768
224Trimethylp	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C7	7.9400	8.1900	8.2396	0.5898	0.5935	0.5904	7.9400	8.1900	8.2396	0.5898	0.5935	0.5904
C8	9.6900	10.0120	10.0758	0.2250	0.2267	0.2252	9.6900	10.0120	10.0758	0.2250	0.2267	0.2252
C9	6.5600	6.7814	6.8253	0.0521	0.0557	0.0527	6.5600	6.7814	6.8253	0.0521	0.0557	0.0527
C10+	56.3900	58.3083	58.6887	0.0000	0.0000	0.0000	56.3900	58.3083	58.6887	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MW (lb/lbmol):	209.36	215.58	216.79	26.68	29.40	27.11	209.36	215.58	216.79	26.68	29.40	27.11
Stream Mole Ratio:	1.0000	0.9671	0.9608	0.0329	0.0063	0.0392	1.0000	0.9671	0.9608	0.0329	0.0063	0.0392
Stream Weight Ratio:	209.36	208.49	208.29	0.88	0.19	1.06	209.36	208.49	208.29	0.88	0.19	1.06
Total Emission (ton):				123.650	26.092	149.702				44.162	9.319	53.467
Heating Value (BTU/scf):				1,526.60	1,629.68	1,543.10				1,526.60	1,629.68	1,543.10
Gas Gravity (Gas/Air):				0.92	1.01	0.94				0.92	1.01	0.94
Bubble Pt. @100°F	97.56	18.02	5.25				97.56	18.02	5.25			
RVP @100°F (psia)	13.38	5.45	3.98				13.38	5.45	3.98			
Spec. Gravity @100°F	0.724	0.726	0.726				0.724	0.726	0.726			

Estimated Actual Annual Emissions Calculations

E&P Tank Runs

Horse Camp 2-11H

Horse Camp 101-11H

Production Rate (bbl/day)	51.7		54.2	
Uncontrolled Emission Summary	ton		ton	
Total HAPs	0.260	0.013	0.270	0.005
Total HC	12.657	0.633	13.259	0.265
NMHC, C2+	7.393	0.370	7.744	0.155
NMNEHC, C3+	6.182	0.309	6.476	0.130
CO2	0.426	0.426	0.446	0.446
CH4	5.265	0.263	5.515	0.110

Uncontrolled Recovery Information

Vapor(mscfd):	1.0100		1.0600	
HC Vapor(mscfd):	0.9800		1.0300	
CO2(mscfd):				
CH4(mscfd):				
GOR(SCF/STB):	19.52		19.56	

Component	Uncontrolled Controlled		Uncontrolled Controlled	
	ton	ton	ton	ton
H2S	0.000	0.000	0.000	0.000
O2	0.000	0.000	0.000	0.000
CO2	0.426	0.426	0.446	0.446
N2	0.069	0.069	0.073	0.073
C1	5.265	0.263	5.515	0.110
C2	1.211	0.061	1.269	0.025
C3	1.653	0.083	1.731	0.035
i-C4	1.033	0.052	1.083	0.022
n-C4	1.127	0.056	1.181	0.024
i-C5	0.765	0.038	0.801	0.016
n-C5	0.602	0.030	0.631	0.013
C6	0.316	0.016	0.331	0.007
Benzene	0.027	0.001	0.028	0.001
Toluene	0.022	0.001	0.023	0.000
E-Benzene	0.001	0.000	0.001	0.000
Xylenes	0.006	0.000	0.006	0.000
n-C6	0.199	0.010	0.209	0.004
224Trimethylp	0.000	0.000	0.000	0.000
C7	0.278	0.014	0.291	0.006
C8	0.121	0.006	0.127	0.003
C9	0.031	0.002	0.033	0.001
C10+	0.000	0.000	0.000	0.000

Estimated Actual Annual Emissions Calculations

E&P Tank Runs

Horse Camp 2-11H

Horse Camp 101-11H

Total	13.152	1.128					13.779	0.786				
Component	LP Oil	Flash Oil	Sales Oil	Flash Gas	W&S Gas	Total	LP Oil	Flash Oil	Sales Oil	Flash Gas	W&S Gas	Total
	mole%	mole%	mole%	mole%	mole%	mole%	mole%	mole%	mole%	mole%	mole%	mole%
H2S	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
O2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CO2	0.0800	0.0260	0.0019	1.6687	3.7141	1.9960	0.0800	0.0260	0.0019	1.6687	3.7141	1.9960
N2	0.0200	0.0009	0.0000	0.5806	0.1431	0.5106	0.0200	0.0009	0.0000	0.5806	0.1431	0.5106
C1	2.6500	0.3584	0.0006	70.0127	55.2139	67.6445	2.6500	0.3584	0.0006	70.0127	55.2139	67.6445
C2	0.3900	0.1808	0.0675	6.5394	17.5551	8.3023	0.3900	0.1808	0.0675	6.5394	17.5551	8.3023
C3	0.9200	0.6987	0.6426	7.4245	9.3012	7.7249	0.9200	0.6987	0.6426	7.4245	9.3012	7.7249
i-C4	0.9800	0.8895	0.8705	3.6407	3.7936	3.6652	0.9800	0.8895	0.8705	3.6407	3.7936	3.6652
n-C4	1.4700	1.3846	1.3670	3.9809	4.0791	3.9966	1.4700	1.3846	1.3670	3.9809	4.0791	3.9966
i-C5	2.0500	2.0455	2.0445	2.1818	2.2002	2.1848	2.0500	2.0455	2.0445	2.1818	2.2002	2.1848
n-C5	2.1600	2.1750	2.1779	1.7185	1.7306	1.7205	2.1600	2.1750	2.1779	1.7185	1.7306	1.7205
C6	3.4500	3.5410	3.5590	0.7751	0.7794	0.7758	3.4500	3.5410	3.5590	0.7751	0.7794	0.7758
Benzene	0.4300	0.4422	0.4447	0.0705	0.0709	0.0705	0.4300	0.4422	0.4447	0.0705	0.0709	0.0705
Toluene	1.1000	1.1357	1.1428	0.0501	0.0505	0.0502	1.1000	1.1357	1.1428	0.0501	0.0505	0.0502
E-Benzene	0.1000	0.1034	0.1040	0.0015	0.0015	0.0015	0.1000	0.1034	0.1040	0.0015	0.0015	0.0015
Xylenes	0.9000	0.9302	0.9362	0.0116	0.0117	0.0116	0.9000	0.9302	0.9362	0.0116	0.0117	0.0116
n-C6	2.7200	2.7963	2.8114	0.4764	0.4791	0.4768	2.7200	2.7963	2.8114	0.4764	0.4791	0.4768
224Trimethylp	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C7	7.9400	8.1900	8.2396	0.5898	0.5935	0.5904	7.9400	8.1900	8.2396	0.5898	0.5935	0.5904
C8	9.6900	10.0120	10.0758	0.2250	0.2267	0.2252	9.6900	10.0120	10.0758	0.2250	0.2267	0.2252
C9	6.5600	6.7814	6.8253	0.0521	0.0557	0.0527	6.5600	6.7814	6.8253	0.0521	0.0557	0.0527
C10+	56.3900	58.3083	58.6887	0.0000	0.0000	0.0000	56.3900	58.3083	58.6887	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	LP Oil	Flash Oil	Sales Oil	Flash Gas	W&S Gas	Total Emission	LP Oil	Flash Oil	Sales Oil	Flash Gas	W&S Gas	Total Emission
MW (lb/lbmol):	209.36	215.58	216.79	26.68	29.40	27.11	209.36	215.58	216.79	26.68	29.40	27.11
Stream Mole Ratio:	1.0000	0.9671	0.9608	0.0329	0.0063	0.0392	1.0000	0.9671	0.9608	0.0329	0.0063	0.0392
Stream Weight Ratio:	209.36	208.49	208.29	0.88	0.19	1.06	209.36	208.49	208.29	0.88	0.19	1.06
Total Emission (ton):				10.863	2.292	13.152				11.381	2.402	13.779
Heating Value (BTU/scf):				1,526.60	1,629.68	1,543.10				1,526.60	1,629.68	1,543.10
Gas Gravity (Gas/Air):				0.92	1.01	0.94				0.92	1.01	0.91
Bubble Pt. @100°F	97.56	18.02	5.25				97.56	18.02	5.25			
RVP @100°F (psia)	13.38	5.45	3.98				13.38	5.45	3.98			
Spec. Gravity @100°F	0.724	0.726	0.726				0.724	0.726	0.726			

Estimated Actual Annual Emissions Calculations

E&P Tank Runs

Component	Flash Gas		W&S Gas	
	Molecular wt Contribution	wt%	Molecular wt Contribution	wt%
H2S	0.00	0.00	0.00	0.00
O2	0.00	0.00	0.00	0.00
CO2	0.73	2.75	1.63	5.55
N2	0.16	0.61	0.04	0.14
C1	11.23	42.06	8.86	30.09
C2	1.97	7.36	5.28	17.94
C3	3.27	12.26	4.10	13.94
i-C4	2.12	7.92	2.20	7.49
n-C4	2.31	8.66	2.37	8.06
i-C5	1.57	5.90	1.59	5.39
n-C5	1.24	4.64	1.25	4.24
C6	0.65	2.44	0.65	2.22
Benzene	0.06	0.21	0.06	0.19
Toluene	0.05	0.17	0.05	0.16
E-Benzene	0.00	0.01	0.00	0.01
Xylenes	0.01	0.05	0.01	0.04
n-C6	0.41	1.54	0.41	1.40
2,2,4-Trimethylp	0.00	0.00	0.00	0.00
C7	0.59	2.21	0.59	2.02
C8	0.26	0.96	0.26	0.88
C9	0.07	0.25	0.07	0.24
C10+	0.00	0.00	0.00	0.00
	0.00	0.00	0.00	0.00
	26.70	100.00	29.43	100.00

APPENDIX C

Supporting Documentation

HORSE CAMP WEST 2MBH

NDIC File No: **34990** API No: **33-025-03507-00-00** CTB No: **234990**
 Well Type: **OG** Well Status: **A** Status Date: **11/16/2018** Wellbore type: **Horizontal**
 Location: **NWNW 11-149-93** Footages: **460 FNL 645 FWL** Latitude: **47.745092** Longitude: **-102.553792**
 Current Operator: **PETROSHALE (US) INC.**
 Current Well Name: **HORSE CAMP WEST 2MBH**
 Elevation(s): **2314 KB 2288 GR 2288 GL** Total Depth: **15983** Field: **MANDAREE**
 Spud Date(s): **7/5/2018**

Completion Data

Pool: **BAKKEN** Perfs: **11319-15978** Comp: **11/16/2018** Status: **F** Date: **11/6/2018** Spacing: **SEC**

Cumulative Production Data

Pool: **BAKKEN** Cum Oil: **38220** Cum MCF Gas: **30002** Cum Water: **35454**

Production Test Data

IP Test Date: **11/16/2018** Pool: **BAKKEN** IP Oil: **760** IP MCF: **469** IP Water: **855**

Monthly Production Data

Pool	Date	Days	BBLs Oil	BBLs Water	MCF Produced	MCF Sold	MCF Vented/Flared
BAKKEN	3/2019	31	15,632	10,415	12,907	12,537	370
BAKKEN	2/2019	28	13,870	9,593	10,634	6,620	4,014
BAKKEN	1/2019	31	17,759	14,340	12,213	10,866	1,347
BAKKEN	12/2018	17	14,341	13,034	13,152	10,457	2,695
BAKKEN	11/2018	8	6,120	8,080	4,637	0	4,637

HORSE CAMP WEST 2TFH

NDIC File No: **34991** API No: **33-025-03508-00-00** CTB No: **234990**
 Well Type: **OG** Well Status: **A** Status Date: **11/23/2018** Wellbore type: **Horizontal**
 Location: **NWNW 11-149-93** Footages: **470 FNL 611 FWL** Latitude: **47.745064** Longitude: **-102.553931**
 Current Operator: **PETROSHALE (US) INC.**
 Current Well Name: **HORSE CAMP WEST 2TFH**
 Elevation(s): **2314 KB 2288 GR 2288 GL** Total Depth: **15980** Field: **MANDAREE**
 Spud Date(s): **7/3/2018**

Completion Data

Pool: **BAKKEN** Perfs: **11309-15975** Comp: **11/23/2018** Status: **F** Date: **11/23/2018** Spacing: **SEC**

Cumulative Production Data

Pool: **BAKKEN** Cum Oil: **11002** Cum MCF Gas: **10982** Cum Water: **35008**

Production Test Data

IP Test Date: **11/23/2018** Pool: **BAKKEN** IP Oil: **237** IP MCF: **157** IP Water: **1001**

Monthly Production Data

Pool	Date	Days	BBLs Oil	BBLs Water	MCF Produced	MCF Sold	MCF Vented/Flared
BAKKEN	3/2019	0	0	0	0	0	0
BAKKEN	2/2019	12	2,249	4,610	1,972	0	1,972
BAKKEN	1/2019	31	7,295	20,176	9,203	2,438	6,765
BAKKEN	12/2018	13	2,867	10,368	1,127	190	937
BAKKEN	11/2018	7	840	4,464	652	0	652

HORSE CAMP 2-11H

NDIC File No: **20091** API No: **33-025-01237-00-00** CTB No: **220090**

Well Type: **OG** Well Status: **IA** Status Date: **8/15/2018** Wellbore type: **Horizontal**

Location: **NWNW 11-149-93** Footages: **495 FNL 530 FWL** Latitude: **47.744995** Longitude: **-102.554261**

Current Operator: **PETROSHALE (US) INC.**

Current Well Name: **HORSE CAMP 2-11H**

Elevation(s): **2317 KB 2290 GR 2287 GL** Total Depth: **15023** Field: **MANDAREE**

Spud Date(s): **3/15/2011**

Casing String(s): **9.625" 2120' 7" 11098'**

Completion Data

Pool: **BAKKEN** Perfs: **11098-15023** Comp: **9/30/2011** Status: **AL** Date: **3/17/2012** Spacing: **W2**

Cumulative Production Data

Pool: **BAKKEN** Cum Oil: **225898** Cum MCF Gas: **215509** Cum Water: **84340**

Production Test Data

IP Test Date: **10/2/2011** Pool: **BAKKEN** IP Oil: **1229** IP MCF: **600** IP Water: **2027**

Monthly Production Data

Pool	Date	Days	BBLs Oil	BBLs Water	MCF Produced	MCF Sold	MCF Vented/Flared
BAKKEN	3/2019	0	0	0	0	0	0
BAKKEN	2/2019	0	0	0	0	0	0
BAKKEN	1/2019	0	0	0	0	0	0
BAKKEN	12/2018	0	0	0	0	0	0
BAKKEN	11/2018	0	0	0	0	0	0
BAKKEN	10/2018	0	0	0	0	0	0
BAKKEN	9/2018	0	0	0	0	0	0
BAKKEN	8/2018	0	0	0	0	0	0
BAKKEN	7/2018	0	0	0	0	0	0
BAKKEN	6/2018	0	0	0	0	0	0
BAKKEN	5/2018	13	780	572	949	0	611
BAKKEN	4/2018	20	1,205	768	1,502	59	942
BAKKEN	3/2018	22	1,296	792	1,165	547	46
BAKKEN	2/2018	16	332	1,473	422	14	239
BAKKEN	1/2018	22	1,069	396	1,216	606	37
BAKKEN	12/2017	31	1,474	525	1,787	925	51
BAKKEN	11/2017	30	1,327	743	1,873	1,049	47
BAKKEN	10/2017	31	1,659	612	2,276	1,410	58
BAKKEN	9/2017	30	1,605	499	2,044	1,231	56
BAKKEN	8/2017	31	1,689	591	1,924	1,084	59
BAKKEN	7/2017	31	1,780	603	2,057	1,186	63
BAKKEN	6/2017	30	1,668	523	1,915	1,126	56
BAKKEN	5/2017	31	1,984	886	2,089	717	562
BAKKEN	4/2017	30	1,522	699	2,033	596	653
BAKKEN	3/2017	31	1,858	642	2,277	1,283	184
BAKKEN	2/2017	28	1,729	600	1,853	1,102	19
BAKKEN	1/2017	31	1,845	708	2,660	1,368	482

HORSE CAMP 101-11H

NDIC File No: **20090** API No: **33-025-01236-00-00** CTB No: **220090**

Well Type: **OG** Well Status: **AB** Status Date: **10/15/2018** Wellbore type: **Horizontal**

Location: **NWNW 11-149-93** Footages: **480 FNL 577 FWL** Latitude: **47.745037** Longitude: **-102.554070**

Current Operator: **PETROSHALE (US) INC.**

Current Well Name: **HORSE CAMP 101-11H**

Elevation(s): **2317 KB 2290 GR 2290 GL** Total Depth: **15285** Field: **MANDAREE**

Spud Date(s): **3/17/2011**

Casing String(s): **9.625" 2121' 7" 11132'**

Completion Data

Pool: **BAKKEN** Perfs: **11132-15285** Comp: **10/2/2011** Status: **AL** Date: **3/11/2012** Spacing: **W2**

Cumulative Production Data

Pool: **BAKKEN** Cum Oil: **189031** Cum MCF Gas: **170803** Cum Water: **59399**

Production Test Data

IP Test Date: **10/5/2011** Pool: **BAKKEN** IP Oil: **392** IP MCF: **472** IP Water: **195**

Monthly Production Data

Pool	Date	Days	BBLs Oil	BBLs Water	MCF Produced	MCF Sold	MCF Vented/Flared
BAKKEN	3/2019	0	0	0	0	0	0
BAKKEN	2/2019	0	0	0	0	0	0
BAKKEN	1/2019	0	0	0	0	0	0
BAKKEN	12/2018	0	0	0	0	0	0
BAKKEN	11/2018	0	0	0	0	0	0
BAKKEN	10/2018	0	0	0	0	0	0
BAKKEN	9/2018	0	0	0	0	0	0
BAKKEN	8/2018	0	0	0	0	0	0
BAKKEN	7/2018	0	0	0	0	0	0
BAKKEN	6/2018	0	0	0	0	0	0
BAKKEN	5/2018	0	0	0	0	0	0
BAKKEN	4/2018	0	0	0	0	0	0
BAKKEN	3/2018	0	0	0	0	0	0
BAKKEN	2/2018	0	0	0	0	0	0
BAKKEN	1/2018	0	0	0	0	0	0
BAKKEN	12/2017	0	0	0	0	0	0
BAKKEN	11/2017	0	0	0	0	0	0
BAKKEN	10/2017	0	0	0	0	0	0
BAKKEN	9/2017	0	0	0	0	0	0
BAKKEN	8/2017	0	0	0	0	0	0
BAKKEN	7/2017	0	0	0	0	0	0
BAKKEN	6/2017	0	0	0	0	0	0
BAKKEN	5/2017	0	0	0	0	0	0
BAKKEN	4/2017	0	0	0	0	0	0
BAKKEN	3/2017	5	9	0	131	0	0
BAKKEN	2/2017	0	0	0	0	0	0
BAKKEN	1/2017	0	0	0	0	0	0
BAKKEN	12/2016	0	0	0	0	0	0

Pool	Date	Days	BBLs Oil	BBLs Water	MCF Produced	MCF Sold	MCF Vented/Flared
BAKKEN	11/2016	0	0	0	0	0	0
BAKKEN	10/2016	0	0	0	0	0	0
BAKKEN	9/2016	0	0	0	0	0	0
BAKKEN	8/2016	0	0	0	0	0	0
BAKKEN	7/2016	0	0	0	0	0	0
BAKKEN	6/2016	0	0	0	0	0	0
BAKKEN	5/2016	0	0	0	0	0	0
BAKKEN	4/2016	0	0	0	0	0	0
BAKKEN	3/2016	0	0	0	0	0	0
BAKKEN	2/2016	0	0	0	0	0	0
BAKKEN	1/2016	0	0	0	0	0	0
BAKKEN	12/2015	18	1,249	557	1,645	1,080	112
BAKKEN	11/2015	29	1,417	682	2,002	900	347
BAKKEN	10/2015	31	1,435	717	2,032	766	456
BAKKEN	9/2015	30	1,430	643	2,044	536	724
BAKKEN	8/2015	31	1,374	561	1,949	66	1,083
BAKKEN	7/2015	31	1,988	755	2,503	200	1,493
BAKKEN	6/2015	30	1,590	584	2,796	1,175	838
BAKKEN	5/2015	31	1,470	503	2,721	1,096	816
BAKKEN	4/2015	30	1,547	587	2,868	1,461	624
BAKKEN	3/2015	31	1,922	759	2,831	1,650	371
BAKKEN	2/2015	28	1,887	597	2,598	1,438	428
BAKKEN	1/2015	26	1,443	606	2,580	1,240	688

Horse Camp 2-11H

	Oil	Gas	SW
5/29/2019	-	-	-
5/30/2019	-	-	133
5/31/2019	17	-	33
6/1/2019	109	4	218
6/2/2019	75	86	252
6/3/2019	77	97	60
6/4/2019	-	-	-
6/5/2019	47	59	55
6/6/2019	70	87	92
6/7/2019	114	110	47
6/8/2019	107	128	62
6/9/2019	131	140	57
6/10/2019	79	104	72
6/11/2019	96	82	73
6/12/2019	84	75	65
6/13/2019	102	79	63
6/14/2019	93	114	70
6/15/2019	94	61	65
6/16/2019	111	66	63
6/17/2019	103	83	60
6/18/2019	101	75	73
6/19/2019	109	69	63
6/20/2019	100	53	65
6/21/2019	109	73	60
6/22/2019	102	60	62
6/23/2019	98	58	65
6/24/2019	106	57	60
6/25/2019	106	61	60
6/26/2019	111	68	58
6/27/2019	102	55	58
6/28/2019	109	61	55
6/29/2019	95	52	45
6/30/2019	183	69	72
7/1/2019	73	47	45
7/2/2019	83	58	52
7/3/2019	106	70	62
7/4/2019	121	82	60
7/5/2019	106	70	72
7/6/2019	107	74	44
7/7/2019	101	41	52
7/8/2019	119	116	58

Horse Camp 101-11H

	Oil	Gas	SW
5/29/2019	-	-	-
5/30/2019	-	-	108
5/31/2019	3	-	322
6/1/2019	44	24	85
6/2/2019	74	84	70
6/3/2019	79	99	58
6/4/2019	54	196	42
6/5/2019	67	84	52
6/6/2019	79	98	43
6/7/2019	71	68	80
6/8/2019	80	96	55
6/9/2019	57	61	62
6/10/2019	80	106	50
6/11/2019	74	63	55
6/12/2019	71	63	53
6/13/2019	79	61	72
6/14/2019	70	86	48
6/15/2019	80	52	57
6/16/2019	74	44	48
6/17/2019	74	59	48
6/18/2019	81	60	57
6/19/2019	65	41	52
6/20/2019	76	40	35
6/21/2019	57	38	53
6/22/2019	70	41	43
6/23/2019	72	43	48
6/24/2019	74	40	47
6/25/2019	55	32	37
6/26/2019	70	43	52
6/27/2019	79	42	45
6/28/2019	67	37	53
6/29/2019	85	46	67
6/30/2019	76	29	48
7/1/2019	80	52	30
7/2/2019	78	55	38
7/3/2019	50	33	60
7/4/2019	80	54	42
7/5/2019	84	56	77
7/6/2019	74	51	58
7/7/2019	80	32	38
7/8/2019	76	74	45

ASTRO-CHEM LAB, INC.

4102 2nd Ave. West

Williston, North Dakota 58802-0972
P.O Box 972

Phone: (701) 572-7355

OIL ANALYSIS REPORT

Sample Number: O-18-1336

Date Of Analysis: 03/26/2018

Company: PetroShale (US), Inc.

City: Denver

State: CO

Well Number: Horse Camp 4-11

Date Received: 03/22/2018

DST Number:

Sample Source: Treater

Formation:

Depth:

Location:

Section:

Twp:

Rng:

County:

Distribution: Distribution List

Specific Gravity:	0.8270 at 60/60 °F
API Gravity:	39.6 at 60 °F
Salt Content:	7 lbs/1000 bbls
Pour Point:	<-40 °F
Viscosity:	2.76 Kinematic cSt at 100°F 35.2 Saybolt Universal Seconds at 100°F
Total Sulfur:	0.09 % by Weight
BS&W:	0.10 % in Gross Sample 0.10 % in Sample as Analyzed
Paraffin:	1.81 % by Weight

Remarks: Sampled 3-22-18

Analyzed By: B. Kylo

ASTRO-CHEM LAB, INC.

4102 2nd Ave. West

Williston, North Dakota 58802-0972
P.O Box 972

Phone: (701) 572-7355

OIL DISTILLATION REPORT

Sample Number: O-18-1336

Date Of Analysis: 03/26/2018

Company: PetroShale (US), Inc.

City: Denver

State: CO

Well Number: Horse Camp 4-11

Date Received: 03/22/2018

DST Number:

Sample Source: Treater

Formation:

Depth:

Location:

Section:

Twtp:

Rng:

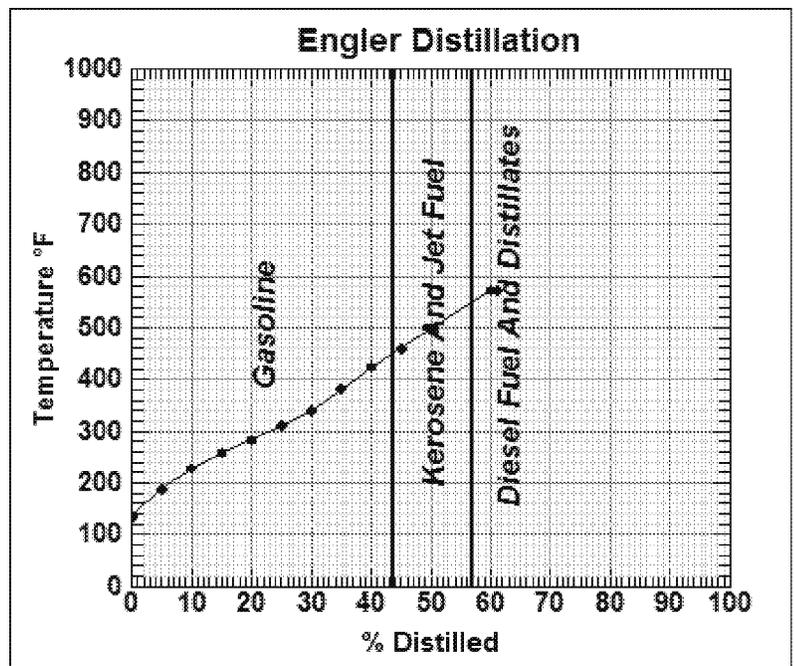
County:

Distribution: Distribution List

ENGLER DISTILLATION; 100mL SAMPLE

INITIAL BOILING POINT 135°F

mL Distilled	Temp °F	% Distilled
IBP	135	
5	188	5
10	228	10
15	257	15
20	283	20
25	311	25
30	340	30
35	381	35
40	423	40
45	460	45
50	498	50
60	573	60
70		70
80		80
90		90
100		100



ASTRO-CHEM LAB, INC.

4102 2nd Ave. West

Williston, North Dakota 58802-0972
P.O Box 972

Phone: (701) 572-7355

NATURAL GAS ANALYSIS

Sample Number: G-18-1337

Date of Analysis: 03/23/2018

Company: PetroShale (US), Inc.

Temperature: °F

Well Number: Horse Camp 4-11

Date Sampled: 03/22/2018

Pressure: PSI

Sample Source: Treater

Sampled By: LL

Type of Analysis: GAS

Analysis By: BK

Formation:

Interval:

Location:

Section:

Twp:

Rng:

County:

Distribution: Distribution List

COMPONENT	MOLE %	GPM
Nitrogen	0.95	0.000
Methane	38.89	0.000
Carbon Dioxide	0.47	0.000
Ethane	22.84	6.098
H2S	0.00	0.000
Propane	19.56	5.363
i-Butane	2.30	0.750
n-Butane	8.21	2.577
i-Pentane	1.54	0.560
n-Pentane	2.46	0.886
Hexanes+	2.78	1.217
Oxygen/Argon	0.00	0.000
Total	100.00	17.451

Calculated Specific Gravity 1.1713 (Air = 1.0000)

Calculated Gross BTU/ft3 1914 (Saturated) 1948 (Dry) at 14.73 psi and 60°F

Remarks: Sampled 3-22-18 by L. Lopez, ACL

ASTRO-CHEM LAB, INC.

4102 2nd Ave. West

Williston, North Dakota 58802-0972
P.O Box 972

Phone: (701) 572-7355

OIL ANALYSIS REPORT

Sample Number: O-18-1333

Date Of Analysis: 03/26/2018

Company: PetroShale (US), Inc.

City: Denver

State: CO

Well Number: Horse Camp 104-11H

Date Received: 03/22/2018

DST Number:

Sample Source: Treater

Formation:

Depth:

Location:

Section:

Twp:

Rng:

County:

Distribution: Distribution List

Specific Gravity:	0.8232 at 60/60 °F
API Gravity:	40.4 at 60 °F
Salt Content:	7 lbs/1000 bbls
Pour Point:	<-40 °F
Viscosity:	2.64 Kinematic cSt at 100°F 34.8 Saybolt Universal Seconds at 100°F
Total Sulfur:	0.09 % by Weight
BS&W:	0.10 % in Gross Sample 0.10 % in Sample as Analyzed
Paraffin:	2.00 % by Weight

Remarks: Sampled 3-22-18

Analyzed By: B. Kylo

ASTRO-CHEM LAB, INC.

4102 2nd Ave. West

Williston, North Dakota 58802-0972
P.O Box 972

Phone: (701) 572-7355

OIL DISTILLATION REPORT

Sample Number: O-18-1333

Date Of Analysis: 03/26/2018

Company: PetroShale (US), Inc.

City: Denver

State: CO

Well Number: Horse Camp 104-11H

Date Received: 03/22/2018

DST Number:

Sample Source: Treater

Formation:

Depth:

Location:

Section:

Twp:

Rng:

County:

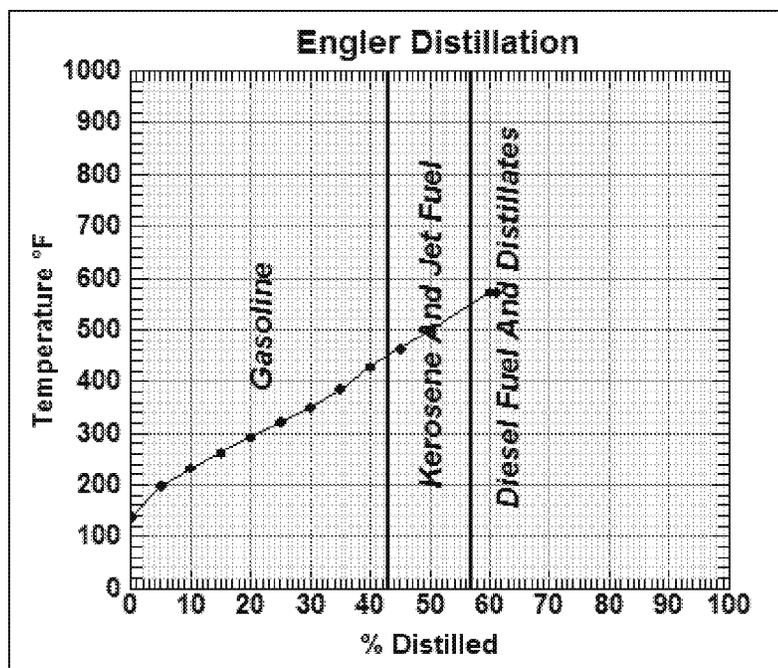
Distribution: Distribution List

ENGLER DISTILLATION; 100mL SAMPLE

INITIAL BOILING POINT

138°F

mL Distilled	Temp °F	% Distilled
IBP	138	
5	197	5
10	232	10
15	262	15
20	292	20
25	321	25
30	350	30
35	384	35
40	428	40
45	463	45
50	500	50
60	572	60
70		70
80		80
90		90
100		100



ASTRO-CHEM LAB, INC.

4102 2nd Ave. West

Williston, North Dakota 58802-0972
P.O Box 972

Phone: (701) 572-7355

NATURAL GAS ANALYSIS

Sample Number: G-18-1334

Date of Analysis: 03/23/2018

Company: PetroShale (US), Inc.

Temperature: °F

Well Number: Horse Camp 104-11H

Date Sampled: 03/22/2018

Pressure: PSI

Sample Source: Treater

Sampled By: LL

Type of Analysis: GAS

Analysis By: BK

Formation:

Interval:

Location:

Section:

Twp:

Rng:

County:

Distribution: Distribution List

COMPONENT	MOLE %	GPM
Nitrogen	0.57	0.000
Methane	35.17	0.000
Carbon Dioxide	0.48	0.000
Ethane	23.92	6.387
H2S	0.00	0.000
Propane	21.07	5.777
i-Butane	2.47	0.805
n-Butane	8.77	2.753
i-Pentane	1.61	0.586
n-Pentane	2.54	0.915
Hexanes+	3.40	1.489
Oxygen/Argon	0.00	0.000
Total	100.00	18.712

Calculated Specific Gravity 1.2199 (Air = 1.0000)

Calculated Gross BTU/ft3 1995 (Saturated) 2030 (Dry) at 14.73 psi and 60°F

Remarks: Sampled 3-22-18 by L. Lopez, ACL

* Project Setup Information *

Project File : \\tsclient\C\Users\jguest\Desktop\PetroShale\Horse Camp 2-11H & 101-11H and Horse Ca
 Flowsheet Selection : Oil Tank with Separator
 Calculation Method : RVP Distillation
 Control Efficiency : 98.0%
 Known Separator Stream : Geographical Region
 Geographical Region : All Regions in US
 Entering Air Composition : No

 Well Name : PetroShale (US), Inc.
 Well ID : Horse Camp West 2MBH
 Date : 2019.04.02

* Data Input *

Separator Pressure : 64.00[psig]
 Separator Temperature : 74.00[F]
 Ambient Pressure : 14.70[psia]
 Ambient Temperature : 70.00[F]
 C10+ SG : 0.8660
 C10+ MW : 301.00

--- Low Pressure Oil -----

No.	Component	mol %
1	H2S	0.0000
2	O2	0.0000
3	CO2	0.0800
4	N2	0.0200
5	C1	2.6500
6	C2	0.3900
7	C3	0.9200
8	i-C4	0.9800
9	n-C4	1.4700
10	i-C5	2.0500
11	n-C5	2.1600
12	C6	3.4500
13	C7	7.9400
14	C8	9.6900
15	C9	6.5600
16	C10+	56.3900
17	Benzene	0.4300
18	Toluene	1.1000
19	E-Benzene	0.1000
20	Xylenes	0.9000
21	n-C6	2.7200
22	224Trimethylp	0.0000

--- Sales Oil -----

Production Rate : 409.5[bbl/day]
 Days of Annual Operation : 365 [days/year]
 API Gravity : 40.0
 Reid Vapor Pressure : 3.90[psia]

* Calculation Results *

--- Emission Summary -----

Item	Uncontrolled [ton/yr]	Uncontrolled [lb/hr]	Controlled [ton/yr]	Controlled [lb/hr]

Total HAPs	2.020	0.461	0.040	0.009
Total HC	100.178	22.872	2.004	0.457
VOCs, C2+	58.511	13.359	1.170	0.267
VOCs, C3+	48.926	11.170	0.979	0.223

Uncontrolled Recovery Info.

Vapor	7.9700	[MSCFD]
HC Vapor	7.7700	[MSCFD]
GOR	19.46	[SCF/bbl]

--- Emission Composition ---

No	Component	Uncontrolled [ton/yr]	Uncontrolled [lb/hr]	Controlled [ton/yr]	Controlled [lb/hr]
1	H2S	0.000	0.000	0.000	0.000
2	O2	0.000	0.000	0.000	0.000
3	CO2	3.373	0.770	3.373	0.770
4	N2	0.549	0.125	0.549	0.125
5	C1	41.667	9.513	0.833	0.190
6	C2	9.585	2.188	0.192	0.044
7	C3	13.079	2.986	0.262	0.060
8	i-C4	8.179	1.867	0.164	0.037
9	n-C4	8.919	2.036	0.178	0.041
10	i-C5	6.052	1.382	0.121	0.028
11	n-C5	4.766	1.088	0.095	0.022
12	C6	2.502	0.571	0.050	0.011
13	C7	2.199	0.502	0.044	0.010
14	C8	0.960	0.219	0.019	0.004
15	C9	0.249	0.057	0.005	0.001
16	C10+	0.000	0.000	0.000	0.000
17	Benzene	0.212	0.048	0.004	0.001
18	Toluene	0.177	0.040	0.004	0.001
19	E-Benzene	0.006	0.001	0.000	0.000
20	Xylenes	0.047	0.011	0.001	0.000
21	n-C6	1.578	0.360	0.032	0.007
22	224Trimethylp	0.000	0.000	0.000	0.000
	Total	104.099	23.767	2.082	0.475

--- Stream Data ---

No.	Component	MW	LP Oil mol %	Flash Oil mol %	Sale Oil mol %	Flash Gas mol %	W&S Gas mol %	Total Emissions mol %
1	H2S	34.80	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	O2	32.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	CO2	44.01	0.0800	0.0260	0.0019	1.6687	3.7141	1.9960
4	N2	28.01	0.0200	0.0009	0.0000	0.5806	0.1431	0.5106
5	C1	16.04	2.6500	0.3584	0.0006	70.0127	55.2139	67.6445
6	C2	30.07	0.3900	0.1808	0.0675	6.5394	17.5551	8.3023
7	C3	44.10	0.9200	0.6987	0.6426	7.4245	9.3012	7.7249
8	i-C4	58.12	0.9800	0.8895	0.8705	3.6407	3.7936	3.6652
9	n-C4	58.12	1.4700	1.3846	1.3670	3.9809	4.0791	3.9966
10	i-C5	72.15	2.0500	2.0455	2.0445	2.1818	2.2002	2.1848
11	n-C5	72.15	2.1600	2.1750	2.1779	1.7185	1.7306	1.7205
12	C6	86.16	3.4500	3.5410	3.5590	0.7751	0.7794	0.7758
13	C7	100.20	7.9400	8.1900	8.2396	0.5898	0.5935	0.5904
14	C8	114.23	9.6900	10.0120	10.0758	0.2250	0.2267	0.2252
15	C9	128.28	6.5600	6.7814	6.8253	0.0521	0.0557	0.0527
16	C10+	301.00	56.3900	58.3083	58.6887	0.0000	0.0000	0.0000
17	Benzene	78.11	0.4300	0.4422	0.4447	0.0705	0.0709	0.0705
18	Toluene	92.13	1.1000	1.1357	1.1428	0.0501	0.0505	0.0502
19	E-Benzene	106.17	0.1000	0.1034	0.1040	0.0015	0.0015	0.0015
20	Xylenes	106.17	0.9000	0.9302	0.9362	0.0116	0.0117	0.0116
21	n-C6	86.18	2.7200	2.7963	2.8114	0.4764	0.4791	0.4768
22	224Trimethylp	114.24	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	MW		209.36	215.58	216.79	26.68	29.40	27.11
	Stream Mole Ratio		1.0000	0.9671	0.9608	0.0329	0.0063	0.0392
	Heating Value	[BTU/SCF]				1526.60	1629.68	1543.10
	Gas Gravity	[Gas/Air]				0.92	1.01	0.94
	Bubble Pt. @ 100F	[psia]	97.56	18.02	5.25			

Total HAPs	2.020	0.461	0.040	0.009
Total HC	100.178	22.872	2.004	0.457
VOCs, C2+	58.511	13.359	1.170	0.267
VOCs, C3+	48.926	11.170	0.979	0.223

Uncontrolled Recovery Info.

Vapor	7.9700	[MSCFD]
HC Vapor	7.7700	[MSCFD]
GOR	19.46	[SCF/bbl]

--- Emission Composition ---

No	Component	Uncontrolled [ton/yr]	Uncontrolled [lb/hr]	Controlled [ton/yr]	Controlled [lb/hr]
1	H2S	0.000	0.000	0.000	0.000
2	O2	0.000	0.000	0.000	0.000
3	CO2	3.373	0.770	3.373	0.770
4	N2	0.549	0.125	0.549	0.125
5	C1	41.667	9.513	0.833	0.190
6	C2	9.585	2.188	0.192	0.044
7	C3	13.079	2.986	0.262	0.060
8	i-C4	8.179	1.867	0.164	0.037
9	n-C4	8.919	2.036	0.178	0.041
10	i-C5	6.052	1.382	0.121	0.028
11	n-C5	4.766	1.088	0.095	0.022
12	C6	2.502	0.571	0.050	0.011
13	C7	2.199	0.502	0.044	0.010
14	C8	0.960	0.219	0.019	0.004
15	C9	0.249	0.057	0.005	0.001
16	C10+	0.000	0.000	0.000	0.000
17	Benzene	0.212	0.048	0.004	0.001
18	Toluene	0.177	0.040	0.004	0.001
19	E-Benzene	0.006	0.001	0.000	0.000
20	Xylenes	0.047	0.011	0.001	0.000
21	n-C6	1.578	0.360	0.032	0.007
22	224Trimethylp	0.000	0.000	0.000	0.000
	Total	104.099	23.767	2.082	0.475

--- Stream Data ---

No.	Component	MW	LP Oil mol %	Flash Oil mol %	Sale Oil mol %	Flash Gas mol %	W&S Gas mol %	Total Emissions mol %
1	H2S	34.80	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	O2	32.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	CO2	44.01	0.0800	0.0260	0.0019	1.6687	3.7141	1.9960
4	N2	28.01	0.0200	0.0009	0.0000	0.5806	0.1431	0.5106
5	C1	16.04	2.6500	0.3584	0.0006	70.0127	55.2139	67.6445
6	C2	30.07	0.3900	0.1808	0.0675	6.5394	17.5551	8.3023
7	C3	44.10	0.9200	0.6987	0.6426	7.4245	9.3012	7.7249
8	i-C4	58.12	0.9800	0.8895	0.8705	3.6407	3.7936	3.6652
9	n-C4	58.12	1.4700	1.3846	1.3670	3.9809	4.0791	3.9966
10	i-C5	72.15	2.0500	2.0455	2.0445	2.1818	2.2002	2.1848
11	n-C5	72.15	2.1600	2.1750	2.1779	1.7185	1.7306	1.7205
12	C6	86.16	3.4500	3.5410	3.5590	0.7751	0.7794	0.7758
13	C7	100.20	7.9400	8.1900	8.2396	0.5898	0.5935	0.5904
14	C8	114.23	9.6900	10.0120	10.0758	0.2250	0.2267	0.2252
15	C9	128.28	6.5600	6.7814	6.8253	0.0521	0.0557	0.0527
16	C10+	301.00	56.3900	58.3083	58.6887	0.0000	0.0000	0.0000
17	Benzene	78.11	0.4300	0.4422	0.4447	0.0705	0.0709	0.0705
18	Toluene	92.13	1.1000	1.1357	1.1428	0.0501	0.0505	0.0502
19	E-Benzene	106.17	0.1000	0.1034	0.1040	0.0015	0.0015	0.0015
20	Xylenes	106.17	0.9000	0.9302	0.9362	0.0116	0.0117	0.0116
21	n-C6	86.18	2.7200	2.7963	2.8114	0.4764	0.4791	0.4768
22	224Trimethylp	114.24	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	MW		209.36	215.58	216.79	26.68	29.40	27.11
	Stream Mole Ratio		1.0000	0.9671	0.9608	0.0329	0.0063	0.0392
	Heating Value	[BTU/SCF]				1526.60	1629.68	1543.10
	Gas Gravity	[Gas/Air]				0.92	1.01	0.94
	Bubble Pt. @ 100F	[psia]	97.56	18.02	5.25			

RVP @ 100F	[psia]	13.38	5.45	3.98
Spec. Gravity @ 100F		0.724	0.726	0.726

* Project Setup Information *

Project File : \\tsclient\C\Users\jguest\Desktop\PetroShale\Horse Camp 2-11H & 101-11H and Horse Ca
 Flowsheet Selection : Oil Tank with Separator
 Calculation Method : RVP Distillation
 Control Efficiency : 98.0%
 Known Separator Stream : Geographical Region
 Geographical Region : All Regions in US
 Entering Air Composition : No

 Well Name : PetroShale (US), Inc.
 Well ID : Horse Camp West 2TFH
 Date : 2019.04.02

* Data Input *

Separator Pressure : 64.00[psig]
 Separator Temperature : 74.00[F]
 Ambient Pressure : 14.70[psia]
 Ambient Temperature : 70.00[F]
 C10+ SG : 0.8660
 C10+ MW : 301.00

--- Low Pressure Oil -----

No.	Component	mol %
1	H2S	0.0000
2	O2	0.0000
3	CO2	0.0800
4	N2	0.0200
5	C1	2.6500
6	C2	0.3900
7	C3	0.9200
8	i-C4	0.9800
9	n-C4	1.4700
10	i-C5	2.0500
11	n-C5	2.1600
12	C6	3.4500
13	C7	7.9400
14	C8	9.6900
15	C9	6.5600
16	C10+	56.3900
17	Benzene	0.4300
18	Toluene	1.1000
19	E-Benzene	0.1000
20	Xylenes	0.9000
21	n-C6	2.7200
22	224Trimethylp	0.0000

--- Sales Oil -----

Production Rate : 129.4[bbl/day]
 Days of Annual Operation : 365 [days/year]
 API Gravity : 40.0
 Reid Vapor Pressure : 3.90[psia]

* Calculation Results *

--- Emission Summary -----

Item	Uncontrolled [ton/yr]	Uncontrolled [lb/hr]	Controlled [ton/yr]	Controlled [lb/hr]

Total HAPs	0.640	0.146	0.013	0.003
Total HC	31.666	7.230	0.633	0.145
VOCs, C2+	18.495	4.223	0.370	0.084
VOCs, C3+	15.465	3.531	0.309	0.071

Uncontrolled Recovery Info.

Vapor	2.5200	[MSCFD]
HC Vapor	2.4600	[MSCFD]
GOR	19.47	[SCF/bbl]

--- Emission Composition ---

No	Component	Uncontrolled [ton/yr]	Uncontrolled [lb/hr]	Controlled [ton/yr]	Controlled [lb/hr]
1	H2S	0.000	0.000	0.000	0.000
2	O2	0.000	0.000	0.000	0.000
3	CO2	1.066	0.243	1.066	0.243
4	N2	0.174	0.040	0.174	0.040
5	C1	13.171	3.007	0.263	0.060
6	C2	3.030	0.692	0.061	0.014
7	C3	4.134	0.944	0.083	0.019
8	i-C4	2.585	0.590	0.052	0.012
9	n-C4	2.819	0.644	0.056	0.013
10	i-C5	1.913	0.437	0.038	0.009
11	n-C5	1.507	0.344	0.030	0.007
12	C6	0.791	0.181	0.016	0.004
13	C7	0.695	0.159	0.014	0.003
14	C8	0.303	0.069	0.006	0.001
15	C9	0.079	0.018	0.002	0.000
16	C10+	0.000	0.000	0.000	0.000
17	Benzene	0.067	0.015	0.001	0.000
18	Toluene	0.056	0.013	0.001	0.000
19	E-Benzene	0.002	0.000	0.000	0.000
20	Xylenes	0.015	0.003	0.000	0.000
21	n-C6	0.499	0.114	0.010	0.002
22	224Trimethylp	0.000	0.000	0.000	0.000
	Total	32.906	7.513	0.658	0.150

--- Stream Data ---

No.	Component	MW	LP Oil mol %	Flash Oil mol %	Sale Oil mol %	Flash Gas mol %	W&S Gas mol %	Total Emissions mol %
1	H2S	34.80	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	O2	32.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	CO2	44.01	0.0800	0.0260	0.0019	1.6687	3.7141	1.9960
4	N2	28.01	0.0200	0.0009	0.0000	0.5806	0.1431	0.5106
5	C1	16.04	2.6500	0.3584	0.0006	70.0127	55.2139	67.6445
6	C2	30.07	0.3900	0.1808	0.0675	6.5394	17.5551	8.3023
7	C3	44.10	0.9200	0.6987	0.6426	7.4245	9.3012	7.7249
8	i-C4	58.12	0.9800	0.8895	0.8705	3.6407	3.7936	3.6652
9	n-C4	58.12	1.4700	1.3846	1.3670	3.9809	4.0791	3.9966
10	i-C5	72.15	2.0500	2.0455	2.0445	2.1818	2.2002	2.1848
11	n-C5	72.15	2.1600	2.1750	2.1779	1.7185	1.7306	1.7205
12	C6	86.16	3.4500	3.5410	3.5590	0.7751	0.7794	0.7758
13	C7	100.20	7.9400	8.1900	8.2396	0.5898	0.5935	0.5904
14	C8	114.23	9.6900	10.0120	10.0758	0.2250	0.2267	0.2252
15	C9	128.28	6.5600	6.7814	6.8253	0.0521	0.0557	0.0527
16	C10+	301.00	56.3900	58.3083	58.6887	0.0000	0.0000	0.0000
17	Benzene	78.11	0.4300	0.4422	0.4447	0.0705	0.0709	0.0705
18	Toluene	92.13	1.1000	1.1357	1.1428	0.0501	0.0505	0.0502
19	E-Benzene	106.17	0.1000	0.1034	0.1040	0.0015	0.0015	0.0015
20	Xylenes	106.17	0.9000	0.9302	0.9362	0.0116	0.0117	0.0116
21	n-C6	86.18	2.7200	2.7963	2.8114	0.4764	0.4791	0.4768
22	224Trimethylp	114.24	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	MW		209.36	215.58	216.79	26.68	29.40	27.11
	Stream Mole Ratio		1.0000	0.9671	0.9608	0.0329	0.0063	0.0392
	Heating Value	[BTU/SCF]				1526.60	1629.68	1543.10
	Gas Gravity	[Gas/Air]				0.92	1.01	0.94
	Bubble Pt. @ 100F	[psia]	97.56	18.02	5.25			

RVP @ 100F	[psia]	13.38	5.45	3.98
Spec. Gravity @ 100F		0.724	0.726	0.726

* Project Setup Information *

Project File : C:\Documents and Settings\AirQuality\Desktop\Horse Camp 2-11H.ept
 Flowsheet Selection : Oil Tank with Separator
 Calculation Method : RVP Distillation
 Control Efficiency : 98.0%
 Known Separator Stream : Geographical Region
 Geographical Region : All Regions in US
 Entering Air Composition : No

Well Name : PetroShale (US), Inc.
 Well ID : Horse Camp 2-11H
 Date : 2019.07.12

* Data Input *

Separator Pressure : 64.00[psig]
 Separator Temperature : 74.00[F]
 Ambient Pressure : 14.70[psia]
 Ambient Temperature : 70.00[F]
 C10+ SG : 0.8660
 C10+ MW : 301.00

--- Low Pressure Oil -----

No.	Component	mol %
1	H2S	0.0000
2	O2	0.0000
3	CO2	0.0800
4	N2	0.0200
5	C1	2.6500
6	C2	0.3900
7	C3	0.9200
8	i-C4	0.9800
9	n-C4	1.4700
10	i-C5	2.0500
11	n-C5	2.1600
12	C6	3.4500
13	C7	7.9400
14	C8	9.6900
15	C9	6.5600
16	C10+	56.3900
17	Benzene	0.4300
18	Toluene	1.1000
19	E-Benzene	0.1000
20	Xylenes	0.9000
21	n-C6	2.7200
22	224Trimethylp	0.0000

--- Sales Oil -----

Production Rate : 91.8[bbl/day]
 Days of Annual Operation : 365 [days/year]
 API Gravity : 40.0
 Reid Vapor Pressure : 3.90[psia]

* Calculation Results *

--- Emission Summary -----

Item	Uncontrolled [ton/yr]	Uncontrolled [lb/hr]	Controlled [ton/yr]	Controlled [lb/hr]
------	--------------------------	-------------------------	------------------------	-----------------------

Total HAPs	0.450	0.103	0.009	0.002
Total HC	22.462	5.128	0.449	0.103
VOCs, C2+	13.120	2.995	0.262	0.060
VOCs, C3+	10.970	2.505	0.219	0.050

Uncontrolled Recovery Info.

Vapor	1.7900	[MSCFD]
HC Vapor	1.7400	[MSCFD]
GOR	19.49	[SCF/bbl]

-- Emission Composition

No	Component	Uncontrolled [ton/yr]	Uncontrolled [lb/hr]	Controlled [ton/yr]	Controlled [lb/hr]
1	H2S	0.000	0.000	0.000	0.000
2	O2	0.000	0.000	0.000	0.000
3	CO2	0.756	0.173	0.756	0.173
4	N2	0.123	0.028	0.123	0.028
5	C1	9.343	2.133	0.187	0.043
6	C2	2.149	0.491	0.043	0.010
7	C3	2.933	0.670	0.059	0.013
8	i-C4	1.834	0.419	0.037	0.008
9	n-C4	2.000	0.457	0.040	0.009
10	i-C5	1.357	0.310	0.027	0.006
11	n-C5	1.069	0.244	0.021	0.005
12	C6	0.561	0.128	0.011	0.003
13	C7	0.493	0.113	0.010	0.002
14	C8	0.215	0.049	0.004	0.001
15	C9	0.056	0.013	0.001	0.000
16	C10+	0.000	0.000	0.000	0.000
17	Benzene	0.047	0.011	0.001	0.000
18	Toluene	0.040	0.009	0.001	0.000
19	E-Benzene	0.001	0.000	0.000	0.000
20	Xylenes	0.011	0.003	0.000	0.000
21	n-C6	0.354	0.081	0.007	0.002
22	224Trimethylp	0.000	0.000	0.000	0.000
	Total	23.342	5.329	0.467	0.107

-- Stream Data

No.	Component	MW	LP Oil mol %	Flash Oil mol %	Sale Oil mol %	Flash Gas mol %	W&S Gas mol %	Total Emissions mol %
1	H2S	34.80	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	O2	32.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	CO2	44.01	0.0800	0.0260	0.0019	1.6687	3.7141	1.9960
4	N2	28.01	0.0200	0.0009	0.0000	0.5806	0.1431	0.5106
5	C1	16.04	2.6500	0.3584	0.0006	70.0127	55.2139	67.6445
6	C2	30.07	0.3900	0.1808	0.0675	6.5394	17.5551	8.3023
7	C3	44.10	0.9200	0.6987	0.6426	7.4245	9.3012	7.7249
8	i-C4	58.12	0.9800	0.8895	0.8705	3.6407	3.7936	3.6652
9	n-C4	58.12	1.4700	1.3846	1.3670	3.9809	4.0791	3.9966
10	i-C5	72.15	2.0500	2.0455	2.0445	2.1818	2.2002	2.1848
11	n-C5	72.15	2.1600	2.1750	2.1779	1.7185	1.7306	1.7205
12	C6	86.16	3.4500	3.5410	3.5590	0.7751	0.7794	0.7758
13	C7	100.20	7.9400	8.1900	8.2396	0.5898	0.5935	0.5904
14	C8	114.23	9.6900	10.0120	10.0758	0.2250	0.2267	0.2252
15	C9	128.28	6.5600	6.7814	6.8253	0.0521	0.0557	0.0527
16	C10+	301.00	56.3900	58.3083	58.6887	0.0000	0.0000	0.0000
17	Benzene	78.11	0.4300	0.4422	0.4447	0.0705	0.0709	0.0705
18	Toluene	92.13	1.1000	1.1357	1.1428	0.0501	0.0505	0.0502
19	E-Benzene	106.17	0.1000	0.1034	0.1040	0.0015	0.0015	0.0015
20	Xylenes	106.17	0.9000	0.9302	0.9362	0.0116	0.0117	0.0116
21	n-C6	86.18	2.7200	2.7963	2.8114	0.4764	0.4791	0.4768
22	224Trimethylp	114.24	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	MW		209.36	215.58	216.79	26.68	29.40	27.11
	Stream Mole Ratio		1.0000	0.9671	0.9608	0.0329	0.0063	0.0392
	Heating Value	[BTU/SCF]				1526.60	1629.68	1543.10
	Gas Gravity	[Gas/Air]				0.92	1.01	0.94
	Bubble Pt. @ 100F	[psia]	97.56	18.02	5.25			

RVP @ 100F	[psia]	13.38	5.45	3.98
Spec. Gravity @ 100F		0.724	0.726	0.726

```

*****
*   Project Setup Information   *
*****
Project File       : C:\Documents and Settings\AirQuality\Desktop\Horse Camp 101-11H.ept
Flowsheet Selection : Oil Tank with Separator
Calculation Method  : RVP Distillation
Control Efficiency  : 98.0%
Known Separator Stream : Geographical Region
Geographical Region : All Regions in US
Entering Air Composition : No

Well Name          : PetroShale (US), Inc.
Well ID            : Horse Camp 101-11H
Date               : 2019.07.12
    
```

```

*****
*   Data Input                 *
*****

Separator Pressure : 64.00[psig]
Separator Temperature : 74.00[F]
Ambient Pressure   : 14.70[psia]
Ambient Temperature : 70.00[F]
C10+ SG            : 0.8660
C10+ MW            : 301.00
    
```

```

-- Low Pressure Oil -----

```

No.	Component	mol %
1	H2S	0.0000
2	O2	0.0000
3	CO2	0.0800
4	N2	0.0200
5	C1	2.6500
6	C2	0.3900
7	C3	0.9200
8	i-C4	0.9800
9	n-C4	1.4700
10	i-C5	2.0500
11	n-C5	2.1600
12	C6	3.4500
13	C7	7.9400
14	C8	9.6900
15	C9	6.5600
16	C10+	56.3900
17	Benzene	0.4300
18	Toluene	1.1000
19	E-Benzene	0.1000
20	Xylenes	0.9000
21	n-C6	2.7200
22	224Trimethylp	0.0000

```

-- Sales Oil -----
Production Rate      : 68.7[bbl/day]
Days of Annual Operation : 365 [days/year]
API Gravity          : 40.0
Reid Vapor Pressure  : 3.90[psia]
    
```

```

*****
*   Calculation Results       *
*****
    
```

```

-- Emission Summary -----

```

Item	Uncontrolled [ton/yr]	Uncontrolled [lb/hr]	Controlled [ton/yr]	Controlled [lb/hr]

Total HAPs	0.340	0.078	0.007	0.002
Total HC	16.814	3.839	0.336	0.077
VOCs, C2+	9.820	2.242	0.196	0.045
VOCs, C3+	8.212	1.875	0.164	0.037

Uncontrolled Recovery Info.

Vapor	1.3400	[MSCFD]
HC Vapor	1.3000	[MSCFD]
GOR	19.50	[SCF/bbl]

--- Emission Composition ---

No	Component	Uncontrolled [ton/yr]	Uncontrolled [lb/hr]	Controlled [ton/yr]	Controlled [lb/hr]
1	H2S	0.000	0.000	0.000	0.000
2	O2	0.000	0.000	0.000	0.000
3	CO2	0.566	0.129	0.566	0.129
4	N2	0.092	0.021	0.092	0.021
5	C1	6.993	1.597	0.140	0.032
6	C2	1.609	0.367	0.032	0.007
7	C3	2.195	0.501	0.044	0.010
8	i-C4	1.373	0.313	0.027	0.006
9	n-C4	1.497	0.342	0.030	0.007
10	i-C5	1.016	0.232	0.020	0.005
11	n-C5	0.800	0.183	0.016	0.004
12	C6	0.420	0.096	0.008	0.002
13	C7	0.369	0.084	0.007	0.002
14	C8	0.161	0.037	0.003	0.001
15	C9	0.042	0.010	0.001	0.000
16	C10+	0.000	0.000	0.000	0.000
17	Benzene	0.036	0.008	0.001	0.000
18	Toluene	0.030	0.007	0.001	0.000
19	E-Benzene	0.001	0.000	0.000	0.000
20	Xylenes	0.008	0.002	0.000	0.000
21	n-C6	0.265	0.061	0.005	0.001
22	224Trimethylp	0.000	0.000	0.000	0.000
	Total	17.473	3.989	0.349	0.080

--- Stream Data ---

No.	Component	MW	LP Oil mol %	Flash Oil mol %	Sale Oil mol %	Flash Gas mol %	W&S Gas mol %	Total Emissions mol %
1	H2S	34.80	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	O2	32.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	CO2	44.01	0.0800	0.0260	0.0019	1.6687	3.7141	1.9960
4	N2	28.01	0.0200	0.0009	0.0000	0.5806	0.1431	0.5106
5	C1	16.04	2.6500	0.3584	0.0006	70.0127	55.2139	67.6445
6	C2	30.07	0.3900	0.1808	0.0675	6.5394	17.5551	8.3023
7	C3	44.10	0.9200	0.6987	0.6426	7.4245	9.3012	7.7249
8	i-C4	58.12	0.9800	0.8895	0.8705	3.6407	3.7936	3.6652
9	n-C4	58.12	1.4700	1.3846	1.3670	3.9809	4.0791	3.9966
10	i-C5	72.15	2.0500	2.0455	2.0445	2.1818	2.2002	2.1848
11	n-C5	72.15	2.1600	2.1750	2.1779	1.7185	1.7306	1.7205
12	C6	86.16	3.4500	3.5410	3.5590	0.7751	0.7794	0.7758
13	C7	100.20	7.9400	8.1900	8.2396	0.5898	0.5935	0.5904
14	C8	114.23	9.6900	10.0120	10.0758	0.2250	0.2267	0.2252
15	C9	128.28	6.5600	6.7814	6.8253	0.0521	0.0557	0.0527
16	C10+	301.00	56.3900	58.3083	58.6887	0.0000	0.0000	0.0000
17	Benzene	78.11	0.4300	0.4422	0.4447	0.0705	0.0709	0.0705
18	Toluene	92.13	1.1000	1.1357	1.1428	0.0501	0.0505	0.0502
19	E-Benzene	106.17	0.1000	0.1034	0.1040	0.0015	0.0015	0.0015
20	Xylenes	106.17	0.9000	0.9302	0.9362	0.0116	0.0117	0.0116
21	n-C6	86.18	2.7200	2.7963	2.8114	0.4764	0.4791	0.4768
22	224Trimethylp	114.24	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	MW		209.36	215.58	216.79	26.68	29.40	27.11
	Stream Mole Ratio		1.0000	0.9671	0.9608	0.0329	0.0063	0.0392
	Heating Value	[BTU/SCF]				1526.60	1629.68	1543.10
	Gas Gravity	[Gas/Air]				0.92	1.01	0.94
	Bubble Pt. @ 100F	[psia]	97.56	18.02	5.25			

RVP @ 100F	[psia]	13.38	5.45	3.98
Spec. Gravity @ 100F		0.724	0.726	0.726

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Identification and Physical Characteristics

Identification

User Identification:	Produced Water Tank
City:	Mandaree
State:	North Dakota
Company:	PetroShale (US), Inc.
Type of Tank:	Vertical Fixed Roof Tank
Description:	Produced Water Tank

Tank Dimensions

Shell Height (ft):	20.00
Diameter (ft):	12.00
Liquid Height (ft) :	17.50
Avg. Liquid Height (ft):	17.50
Volume (gallons):	16,074.56
Turnovers:	147.14
Net Throughput(gal/yr):	2,365,251.50
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Cone
Height (ft)	1.00
Slope (ft/ft) (Cone Roof)	0.17

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meteorological Data used in Emissions Calculations: Williston, North Dakota (Avg Atmospheric Pressure = 13.82 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

Produced Water Tank - Vertical Fixed Roof Tank
Mandaree, North Dakota

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Produced Water	Jan	27.65	23.33	31.96	41.45	0.0802	0.0675	0.0951	20.6773			18.88	
Crude oil (RVP 5)		1.4615				1.3261	1.6079	50.0000	50.0000	0.0500	0.2009	207.00	Option 4: RVP=5
Water		0.0739				0.0617	0.0882	18.0200	18.0200	0.9500	0.7991	18.02	Option 2: A=8.10765, B=1750.286, C=235
Produced Water	Feb	31.17	26.51	35.84	41.45	0.0922	0.0766	0.1106	20.5196			18.88	
Crude oil (RVP 5)		1.5803				1.4246	1.7497	50.0000	50.0000	0.0500	0.1905	207.00	Option 4: RVP=5
Water		0.0854				0.0705	0.1031	18.0200	18.0200	0.9500	0.8095	18.02	Option 2: A=8.10765, B=1750.286, C=235
Produced Water	Mar	37.19	31.92	42.46	41.45	0.1164	0.0949	0.1422	20.2764			18.88	
Crude oil (RVP 5)		1.8012				1.6063	2.0149	50.0000	50.0000	0.0500	0.1740	207.00	Option 4: RVP=5
Water		0.1087				0.0880	0.1336	18.0200	18.0200	0.9500	0.8260	18.02	Option 2: A=8.10765, B=1750.286, C=235
Produced Water	Apr	44.20	37.87	50.52	41.45	0.1517	0.1195	0.1913	20.0292			18.88	
Crude oil (RVP 5)		2.0894				1.8277	2.3807	50.0000	50.0000	0.0500	0.1568	207.00	Option 4: RVP=5
Water		0.1428				0.1117	0.1813	18.0200	18.0200	0.9500	0.8432	18.02	Option 2: A=8.10765, B=1750.286, C=235
Produced Water	May	49.98	43.10	56.85	41.45	0.1876	0.1456	0.2400	19.8505			18.88	
Crude oil (RVP 5)		2.3543				2.0422	2.7040	50.0000	50.0000	0.0500	0.1442	207.00	Option 4: RVP=5
Water		0.1777				0.1369	0.2287	18.0200	18.0200	0.9500	0.8558	18.02	Option 2: A=8.10765, B=1750.286, C=235
Produced Water	Jun	54.43	47.20	61.65	41.45	0.2202	0.1695	0.2839	19.7264			18.88	
Crude oil (RVP 5)		2.5765				2.2242	2.9724	50.0000	50.0000	0.0500	0.1352	207.00	Option 4: RVP=5
Water		0.2094				0.1601	0.2716	18.0200	18.0200	0.9500	0.8648	18.02	Option 2: A=8.10765, B=1750.286, C=235
Produced Water	Jul	57.24	49.54	64.95	41.45	0.2433	0.1846	0.3180	19.6535			18.88	
Crude oil (RVP 5)		2.7253				2.3335	3.1685	50.0000	50.0000	0.0500	0.1299	207.00	Option 4: RVP=5
Water		0.2320				0.1748	0.3049	18.0200	18.0200	0.9500	0.8701	18.02	Option 2: A=8.10765, B=1750.286, C=235
Produced Water	Aug	55.94	48.47	63.41	41.45	0.2324	0.1776	0.3017	19.6867			18.88	
Crude oil (RVP 5)		2.6556				2.2828	3.0759	50.0000	50.0000	0.0500	0.1324	207.00	Option 4: RVP=5
Water		0.2213				0.1679	0.2890	18.0200	18.0200	0.9500	0.8676	18.02	Option 2: A=8.10765, B=1750.286, C=235
Produced Water	Sep	49.76	43.18	56.34	41.45	0.1861	0.1460	0.2357	19.8568			18.88	
Crude oil (RVP 5)		2.3441				2.0455	2.6769	50.0000	50.0000	0.0500	0.1446	207.00	Option 4: RVP=5
Water		0.1763				0.1373	0.2245	18.0200	18.0200	0.9500	0.8554	18.02	Option 2: A=8.10765, B=1750.286, C=235
Produced Water	Oct	44.08	38.23	49.93	41.45	0.1510	0.1212	0.1873	20.0330			18.88	
Crude oil (RVP 5)		2.0844				1.8418	2.3521	50.0000	50.0000	0.0500	0.1571	207.00	Option 4: RVP=5
Water		0.1422				0.1133	0.1774	18.0200	18.0200	0.9500	0.8429	18.02	Option 2: A=8.10765, B=1750.286, C=235
Produced Water	Nov	35.80	31.32	40.28	41.45	0.1104	0.0928	0.1309	20.3298			18.88	
Crude oil (RVP 5)		1.7481				1.5856	1.9239	50.0000	50.0000	0.0500	0.1776	207.00	Option 4: RVP=5
Water		0.1029				0.0859	0.1227	18.0200	18.0200	0.9500	0.8224	18.02	Option 2: A=8.10765, B=1750.286, C=235
Produced Water	Dec	29.47	25.33	33.61	41.45	0.0862	0.0731	0.1014	20.5944			18.88	
Crude oil (RVP 5)		1.5219				1.3873	1.6669	50.0000	50.0000	0.0500	0.1954	207.00	Option 4: RVP=5
Water		0.0796				0.0671	0.0942	18.0200	18.0200	0.9500	0.8046	18.02	Option 2: A=8.10765, B=1750.286, C=235

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

Produced Water Tank - Vertical Fixed Roof Tank
Mandaree, North Dakota

Month:	January	February	March	April	May	June	July	August	September	October	November	December
Standing Losses (lb):	0.1029	0.1149	0.1795	0.2697	0.3714	0.4412	0.5372	0.4975	0.3405	0.2549	0.1379	0.1047
Vapor Space Volume (cu ft):	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425
Vapor Density (lb/cu ft):	0.0003	0.0004	0.0004	0.0006	0.0007	0.0008	0.0009	0.0008	0.0007	0.0006	0.0004	0.0003
Vapor Space Expansion Factor:	0.0331	0.0361	0.0415	0.0511	0.0565	0.0602	0.0650	0.0627	0.0538	0.0469	0.0345	0.0316
Vented Vapor Saturation Factor:	0.9881	0.9863	0.9828	0.9777	0.9726	0.9680	0.9647	0.9663	0.9728	0.9778	0.9837	0.9872
Tank Vapor Space Volume:												
Vapor Space Volume (cu ft):	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425
Tank Diameter (ft):	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000
Vapor Space Outage (ft):	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333
Tank Shell Height (ft):	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000
Average Liquid Height (ft):	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000
Roof Outage (ft):	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333
Roof Outage (Cone Roof)												
Roof Outage (ft):	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333
Roof Height (ft):	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Roof Slope (ft/ft):	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700
Shell Radius (ft):	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000
Vapor Density												
Vapor Density (lb/cu ft):	0.0003	0.0004	0.0004	0.0006	0.0007	0.0008	0.0009	0.0008	0.0007	0.0006	0.0004	0.0003
Vapor Molecular Weight (lb/lb-mole):	20.6773	20.5196	20.2764	20.0292	19.8505	19.7264	19.6535	19.6867	19.8568	20.0330	20.3298	20.5944
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0802	0.0922	0.1164	0.1517	0.1876	0.2202	0.2433	0.2324	0.1861	0.1510	0.1104	0.0862
Daily Avg. Liquid Surface Temp. (deg. R):	487.3186	490.8447	496.8602	503.8659	509.6452	514.0987	516.9127	515.6102	509.4312	503.7493	495.4708	489.1381
Daily Average Ambient Temp. (deg. F):	8.9000	16.0500	28.4000	43.1500	55.2500	64.7000	70.6500	68.7000	56.2500	44.7500	27.1500	13.2000
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731
Liquid Bulk Temperature (deg. R):	501.1192	501.1192	501.1192	501.1192	501.1192	501.1192	501.1192	501.1192	501.1192	501.1192	501.1192	501.1192
Tank Paint Solar Absorptance (Shell):	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	388.0000	671.0000	1,104.0000	1,488.0000	1,827.0000	2,047.0000	2,193.0000	1,862.0000	1,340.0000	877.0000	479.0000	334.0000
Vapor Space Expansion Factor												
Vapor Space Expansion Factor:	0.0331	0.0361	0.0415	0.0511	0.0565	0.0602	0.0650	0.0627	0.0538	0.0469	0.0345	0.0316
Daily Vapor Temperature Range (deg. R):	17.2549	18.6740	21.0950	25.2989	27.4885	28.8957	30.8147	29.8871	26.3224	23.3985	17.9040	16.5658
Daily Vapor Pressure Range (psia):	0.0276	0.0339	0.0472	0.0718	0.0944	0.1144	0.1333	0.1241	0.0897	0.0661	0.0382	0.0283
Breather Vent Press. Setting Range(psia):	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0802	0.0922	0.1164	0.1517	0.1876	0.2202	0.2433	0.2324	0.1861	0.1510	0.1104	0.0862
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0675	0.0766	0.0949	0.1195	0.1456	0.1695	0.1846	0.1776	0.1460	0.1212	0.0928	0.0731
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0951	0.1106	0.1422	0.1913	0.2400	0.2839	0.3180	0.3017	0.2357	0.1873	0.1309	0.1014
Daily Avg. Liquid Surface Temp. (deg R):	487.3186	490.8447	496.8602	503.8659	509.6452	514.0987	516.9127	515.6102	509.4312	503.7493	495.4708	489.1381
Daily Min. Liquid Surface Temp. (deg R):	483.0049	486.1762	491.5864	497.5412	502.7731	506.8747	509.2091	508.1384	502.8506	497.8997	490.9948	484.9966
Daily Max. Liquid Surface Temp. (deg R):	491.6323	495.5132	502.1340	510.1906	516.5173	521.3226	524.6164	523.0820	516.0118	509.5990	499.9468	493.2796
Daily Ambient Temp. Range (deg. R):	21.4000	21.5000	22.0000	25.3000	26.1000	26.6000	28.3000	29.2000	27.7000	26.7000	21.7000	20.8000
Vented Vapor Saturation Factor												
Vented Vapor Saturation Factor:	0.9881	0.9863	0.9828	0.9777	0.9726	0.9680	0.9647	0.9663	0.9728	0.9778	0.9837	0.9872
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0802	0.0922	0.1164	0.1517	0.1876	0.2202	0.2433	0.2324	0.1861	0.1510	0.1104	0.0862
Vapor Space Outage (ft):	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333
Working Losses (lb):	2.1634	2.4679	3.0791	3.9623	4.8568	5.6659	6.2377	5.9669	4.8207	3.9459	2.9269	2.3160

Vapor Molecular Weight (lb/lb-mole):	20.6773	20.5196	20.2764	20.0292	19.8505	19.7264	19.6535	19.6867	19.8568	20.0330	20.3298	20.5944
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0802	0.0922	0.1164	0.1517	0.1876	0.2202	0.2433	0.2324	0.1861	0.1510	0.1104	0.0862
Net Throughput (gal/mo.):	197,104.2917	197,104.2917	197,104.2917	197,104.2917	197,104.2917	197,104.2917	197,104.2917	197,104.2917	197,104.2917	197,104.2917	197,104.2917	197,104.2917
Annual Turnovers:	147.1425	147.1425	147.1425	147.1425	147.1425	147.1425	147.1425	147.1425	147.1425	147.1425	147.1425	147.1425
Turnover Factor:	0.3706	0.3706	0.3706	0.3706	0.3706	0.3706	0.3706	0.3706	0.3706	0.3706	0.3706	0.3706
Maximum Liquid Volume (gal):	16,074.5628	16,074.5628	16,074.5628	16,074.5628	16,074.5628	16,074.5628	16,074.5628	16,074.5628	16,074.5628	16,074.5628	16,074.5628	16,074.5628
Maximum Liquid Height (ft):	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000
Tank Diameter (ft):	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000
Working Loss Product Factor:	0.7500	0.7500	0.7500	0.7500	0.7500	0.7500	0.7500	0.7500	0.7500	0.7500	0.7500	0.7500
Total Losses (lb):	2.2663	2.5828	3.2586	4.2320	5.2282	6.1071	6.7749	6.4644	5.1611	4.2009	3.0647	2.4207

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: January, February, March, April, May, June, July, August, September, October, November, December

Produced Water Tank - Vertical Fixed Roof Tank
Mandaree, North Dakota

Components	Losses(lbs)		
	Working Loss	Breathing Loss	Total Emissions
Produced Water	48.41	3.35	51.76
Crude oil (RVP 5)	7.42	0.50	7.92
Water	40.99	2.85	43.84

* Project Setup Information *

Project File : \\tsclient\C\Users\jguest\Desktop\PetroShale\Horse Camp 2-11H & 101-11H and Horse Camp West 2MBH & 2TFH\E&P Tanks\Actual Annual Emissions\Horse Camp West 2MBH.ept
 Flowsheet Selection : Oil Tank with Separator
 Calculation Method : RVP Distillation
 Control Efficiency : 95.0%
 Known Separator Stream : Low Pressure Oil
 Entering Air Composition : No

Date : 2019.05.17

* Data Input *

Separator Pressure : 64.00[psig]
 Separator Temperature : 74.00[F]
 Ambient Pressure : 14.70[psia]
 Ambient Temperature : 70.00[F]
 C10+ SG : 0.8660
 C10+ MW : 301.00

-- Low Pressure Oil -----

No.	Component	mol %
1	H2S	0.0000
2	O2	0.0000
3	CO2	0.0800
4	N2	0.0200
5	C1	2.6500
6	C2	0.3900
7	C3	0.9200
8	i-C4	0.9800
9	n-C4	1.4700
10	i-C5	2.0500
11	n-C5	2.1600
12	C6	3.4500
13	C7	7.9400
14	C8	9.6900
15	C9	6.5600
16	C10+	56.3900
17	Benzene	0.4300
18	Toluene	1.1000
19	E-Benzene	0.1000
20	Xylenes	0.9000
21	n-C6	2.7200
22	224Trimethylp	0.0000

-- Sales Oil -----

Production Rate : 588.9[bbl/day]
 Days of Annual Operation : 365 [days/year]
 API Gravity : 40.0
 Reid Vapor Pressure : 3.90[psia]

* Calculation Results *

-- Emission Summary -----

Item	Uncontrolled [ton/yr]	Uncontrolled [lb/hr]	Controlled [ton/yr]	Controlled [lb/hr]
Total HAPs	2.900	0.662	0.145	0.033
Total HC	144.063	32.891	7.203	1.645
VOCs, C2+	84.143	19.211	4.207	0.961
VOCs, C3+	70.359	16.064	3.518	0.803

Uncontrolled Recovery Info.
 Vapor : 11.4700 [MSCFD]
 HC Vapor : 11.1800 [MSCFD]
 GOR : 19.48 [SCF/bbl]

-- Emission Composition

No	Component	Uncontrolled [ton/yr]	Uncontrolled [lb/hr]	Controlled [ton/yr]	Controlled [lb/hr]
1	H2S	0.000	0.000	0.000	0.000
2	O2	0.000	0.000	0.000	0.000
3	CO2	4.850	1.107	4.850	1.107
4	N2	0.790	0.180	0.790	0.180
5	C1	59.920	13.680	2.996	0.684
6	C2	13.784	3.147	0.689	0.157
7	C3	18.808	4.294	0.940	0.215
8	i-C4	11.763	2.686	0.588	0.134
9	n-C4	12.826	2.928	0.641	0.146
10	i-C5	8.704	1.987	0.435	0.099
11	n-C5	6.854	1.565	0.343	0.078
12	C6	3.598	0.821	0.180	0.041
13	C7	3.162	0.722	0.158	0.036
14	C8	1.380	0.315	0.069	0.016
15	C9	0.358	0.082	0.018	0.004
16	C10+	0.000	0.000	0.000	0.000
17	Benzene	0.304	0.069	0.015	0.003
18	Toluene	0.255	0.058	0.013	0.003
19	E-Benzene	0.009	0.002	0.000	0.000
20	Xylenes	0.068	0.016	0.003	0.001
21	n-C6	2.269	0.518	0.113	0.026
22	224Trimethylp	0.000	0.000	0.000	0.000
	Total	149.702	34.179	7.485	1.709

-- Stream Data

No.	Component	MW	LP Oil mol %	Flash Oil mol %	Sale Oil mol %	Flash Gas mol %	W&S Gas mol %	Total Emissions mol %
1	H2S	34.80	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	O2	32.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	CO2	44.01	0.0800	0.0260	0.0019	1.6687	3.7141	1.9960
4	N2	28.01	0.0200	0.0009	0.0000	0.5806	0.1431	0.5106
5	C1	16.04	2.6500	0.3584	0.0006	70.0127	55.2139	67.6445
6	C2	30.07	0.3900	0.1808	0.0675	6.5394	17.5551	8.3023
7	C3	44.10	0.9200	0.6987	0.6426	7.4245	9.3012	7.7249
8	i-C4	58.12	0.9800	0.8895	0.8705	3.6407	3.7936	3.6652
9	n-C4	58.12	1.4700	1.3846	1.3670	3.9809	4.0791	3.9966
10	i-C5	72.15	2.0500	2.0455	2.0445	2.1818	2.2002	2.1848
11	n-C5	72.15	2.1600	2.1750	2.1779	1.7185	1.7306	1.7205
12	C6	86.16	3.4500	3.5410	3.5590	0.7751	0.7794	0.7758
13	C7	100.20	7.9400	8.1900	8.2396	0.5898	0.5935	0.5904
14	C8	114.23	9.6900	10.0120	10.0758	0.2250	0.2267	0.2252
15	C9	128.28	6.5600	6.7814	6.8253	0.0521	0.0557	0.0527
16	C10+	301.00	56.3900	58.3083	58.6887	0.0000	0.0000	0.0000
17	Benzene	78.11	0.4300	0.4422	0.4447	0.0705	0.0709	0.0705
18	Toluene	92.13	1.1000	1.1357	1.1428	0.0501	0.0505	0.0502
19	E-Benzene	106.17	0.1000	0.1034	0.1040	0.0015	0.0015	0.0015
20	Xylenes	106.17	0.9000	0.9302	0.9362	0.0116	0.0117	0.0116
21	n-C6	86.18	2.7200	2.7963	2.8114	0.4764	0.4791	0.4768
22	224Trimethylp	114.24	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	MW		209.36	215.58	216.79	26.68	29.40	27.11
	Stream Mole Ratio		1.0000	0.9671	0.9608	0.0329	0.0063	0.0392
	Heating Value [BTU/SCF]					1526.60	1629.68	1543.10
	Gas Gravity [Gas/Air]					0.92	1.01	0.94
	Bubble Pt. @ 100F [psia]		97.56	18.02	5.25			
	RVP @ 100F [psia]		13.38	5.45	3.98			
	Spec. Gravity @ 100F		0.724	0.726	0.726			

* Project Setup Information *

Project File : \\tsclient\C\Users\jguest\Desktop\PetroShale\Horse Camp 2-11H & 101-11H and Horse Ca
 Flowsheet Selection : Oil Tank with Separator
 Calculation Method : RVP Distillation
 Control Efficiency : 98.0%
 Known Separator Stream : Geographical Region
 Geographical Region : All Regions in US
 Entering Air Composition : No

 Well Name : PetroShale (US), Inc.
 Well ID : Horse Camp West 2TFH
 Date : 2019.05.17

* Data Input *

Separator Pressure : 64.00[psig]
 Separator Temperature : 74.00[F]
 Ambient Pressure : 14.70[psia]
 Ambient Temperature : 70.00[F]
 C10+ SG : 0.8660
 C10+ MW : 301.00

--- Low Pressure Oil -----

No.	Component	mol %
1	H2S	0.0000
2	O2	0.0000
3	CO2	0.0800
4	N2	0.0200
5	C1	2.6500
6	C2	0.3900
7	C3	0.9200
8	i-C4	0.9800
9	n-C4	1.4700
10	i-C5	2.0500
11	n-C5	2.1600
12	C6	3.4500
13	C7	7.9400
14	C8	9.6900
15	C9	6.5600
16	C10+	56.3900
17	Benzene	0.4300
18	Toluene	1.1000
19	E-Benzene	0.1000
20	Xylenes	0.9000
21	n-C6	2.7200
22	224Trimethylp	0.0000

--- Sales Oil -----

Production Rate : 210.3[bbl/day]
 Days of Annual Operation : 365 [days/year]
 API Gravity : 40.0
 Reid Vapor Pressure : 3.90[psia]

* Calculation Results *

--- Emission Summary -----

Item	Uncontrolled [ton/yr]	Uncontrolled [lb/hr]	Controlled [ton/yr]	Controlled [lb/hr]
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Total HAPs	1.040	0.237	0.021	0.005
Total HC	51.454	11.747	1.029	0.235
VOCs, C2+	30.053	6.861	0.601	0.137
VOCs, C3+	25.130	5.737	0.503	0.115

Uncontrolled Recovery Info.

Vapor	4.1000	[MSCFD]
HC Vapor	3.9900	[MSCFD]
GOR	19.49	[SCF/bbl]

--- Emission Composition ---

No	Component	Uncontrolled [ton/yr]	Uncontrolled [lb/hr]	Controlled [ton/yr]	Controlled [lb/hr]
1	H2S	0.000	0.000	0.000	0.000
2	O2	0.000	0.000	0.000	0.000
3	CO2	1.732	0.395	1.732	0.395
4	N2	0.282	0.064	0.282	0.064
5	C1	21.401	4.886	0.428	0.098
6	C2	4.923	1.124	0.098	0.022
7	C3	6.718	1.534	0.134	0.031
8	i-C4	4.201	0.959	0.084	0.019
9	n-C4	4.581	1.046	0.092	0.021
10	i-C5	3.109	0.710	0.062	0.014
11	n-C5	2.448	0.559	0.049	0.011
12	C6	1.285	0.293	0.026	0.006
13	C7	1.129	0.258	0.023	0.005
14	C8	0.493	0.113	0.010	0.002
15	C9	0.128	0.029	0.003	0.001
16	C10+	0.000	0.000	0.000	0.000
17	Benzene	0.109	0.025	0.002	0.000
18	Toluene	0.091	0.021	0.002	0.000
19	E-Benzene	0.003	0.001	0.000	0.000
20	Xylenes	0.024	0.005	0.000	0.000
21	n-C6	0.810	0.185	0.016	0.004
22	224Trimethylp	0.000	0.000	0.000	0.000
	Total	53.467	12.207	1.069	0.244

--- Stream Data ---

No.	Component	MW	LP Oil mol %	Flash Oil mol %	Sale Oil mol %	Flash Gas mol %	W&S Gas mol %	Total Emissions mol %
1	H2S	34.80	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	O2	32.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	CO2	44.01	0.0800	0.0260	0.0019	1.6687	3.7141	1.9960
4	N2	28.01	0.0200	0.0009	0.0000	0.5806	0.1431	0.5106
5	C1	16.04	2.6500	0.3584	0.0006	70.0127	55.2139	67.6445
6	C2	30.07	0.3900	0.1808	0.0675	6.5394	17.5551	8.3023
7	C3	44.10	0.9200	0.6987	0.6426	7.4245	9.3012	7.7249
8	i-C4	58.12	0.9800	0.8895	0.8705	3.6407	3.7936	3.6652
9	n-C4	58.12	1.4700	1.3846	1.3670	3.9809	4.0791	3.9966
10	i-C5	72.15	2.0500	2.0455	2.0445	2.1818	2.2002	2.1848
11	n-C5	72.15	2.1600	2.1750	2.1779	1.7185	1.7306	1.7205
12	C6	86.16	3.4500	3.5410	3.5590	0.7751	0.7794	0.7758
13	C7	100.20	7.9400	8.1900	8.2396	0.5898	0.5935	0.5904
14	C8	114.23	9.6900	10.0120	10.0758	0.2250	0.2267	0.2252
15	C9	128.28	6.5600	6.7814	6.8253	0.0521	0.0557	0.0527
16	C10+	301.00	56.3900	58.3083	58.6887	0.0000	0.0000	0.0000
17	Benzene	78.11	0.4300	0.4422	0.4447	0.0705	0.0709	0.0705
18	Toluene	92.13	1.1000	1.1357	1.1428	0.0501	0.0505	0.0502
19	E-Benzene	106.17	0.1000	0.1034	0.1040	0.0015	0.0015	0.0015
20	Xylenes	106.17	0.9000	0.9302	0.9362	0.0116	0.0117	0.0116
21	n-C6	86.18	2.7200	2.7963	2.8114	0.4764	0.4791	0.4768
22	224Trimethylp	114.24	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	MW		209.36	215.58	216.79	26.68	29.40	27.11
	Stream Mole Ratio		1.0000	0.9671	0.9608	0.0329	0.0063	0.0392
	Heating Value	[BTU/SCF]				1526.60	1629.68	1543.10
	Gas Gravity	[Gas/Air]				0.92	1.01	0.94
	Bubble Pt. @ 100F	[psia]	97.56	18.02	5.25			

RVP @ 100F	[psia]	13.38	5.45	3.98
Spec. Gravity @ 100F		0.724	0.726	0.726

* Project Setup Information *

Project File : \\tsclient\C\Users\jguest\Desktop\PetroShale\Horse Camp 2-11H & 101-11H and Horse Ca
 Flowsheet Selection : Oil Tank with Separator
 Calculation Method : RVP Distillation
 Control Efficiency : 95.0%
 Known Separator Stream : Low Pressure Oil
 Entering Air Composition : No

Well ID : Horse Camp 2-11H
 Date : 2019.05.17

 * Data Input *

Separator Pressure : 64.00[psig]
 Separator Temperature : 74.00[F]
 Ambient Pressure : 14.70[psia]
 Ambient Temperature : 70.00[F]
 C10+ SG : 0.8660
 C10+ MW : 301.00

--- Low Pressure Oil ---

No.	Component	mol %
1	H2S	0.0000
2	O2	0.0000
3	CO2	0.0800
4	N2	0.0200
5	C1	2.6500
6	C2	0.3900
7	C3	0.9200
8	i-C4	0.9800
9	n-C4	1.4700
10	i-C5	2.0500
11	n-C5	2.1600
12	C6	3.4500
13	C7	7.9400
14	C8	9.6900
15	C9	6.5600
16	C10+	56.3900
17	Benzene	0.4300
18	Toluene	1.1000
19	E-Benzene	0.1000
20	Xylenes	0.9000
21	n-C6	2.7200
22	224Trimethylp	0.0000

--- Sales Oil ---

Production Rate : 51.7[bbl/day]
 Days of Annual Operation : 365 [days/year]
 API Gravity : 40.0
 Reid Vapor Pressure : 3.90[psia]

 * Calculation Results *

--- Emission Summary ---

Item	Uncontrolled [ton/yr]	Uncontrolled [lb/hr]	Controlled [ton/yr]	Controlled [lb/hr]
Total HAPs	0.260	0.059	0.013	0.003
Total HC	12.657	2.890	0.633	0.144

VOCs, C2+	7.393	1.688	0.370	0.084
VOCs, C3+	6.182	1.411	0.309	0.071

Uncontrolled Recovery Info.

Vapor	1.0100	[MSCFD]
HC Vapor	0.9800	[MSCFD]
GOR	19.52	[SCF/bbl]

--- Emission Composition ---

No	Component	Uncontrolled [ton/yr]	Uncontrolled [lb/hr]	Controlled [ton/yr]	Controlled [lb/hr]
1	H2S	0.000	0.000	0.000	0.000
2	O2	0.000	0.000	0.000	0.000
3	CO2	0.426	0.097	0.426	0.097
4	N2	0.069	0.016	0.069	0.016
5	C1	5.265	1.202	0.263	0.060
6	C2	1.211	0.276	0.061	0.014
7	C3	1.653	0.377	0.083	0.019
8	i-C4	1.033	0.236	0.052	0.012
9	n-C4	1.127	0.257	0.056	0.013
10	i-C5	0.765	0.175	0.038	0.009
11	n-C5	0.602	0.137	0.030	0.007
12	C6	0.316	0.072	0.016	0.004
13	C7	0.278	0.063	0.014	0.003
14	C8	0.121	0.028	0.006	0.001
15	C9	0.031	0.007	0.002	0.000
16	C10+	0.000	0.000	0.000	0.000
17	Benzene	0.027	0.006	0.001	0.000
18	Toluene	0.022	0.005	0.001	0.000
19	E-Benzene	0.001	0.000	0.000	0.000
20	Xylenes	0.006	0.001	0.000	0.000
21	n-C6	0.199	0.045	0.010	0.002
22	224Trimethylp	0.000	0.000	0.000	0.000
	Total	13.152	3.003	0.658	0.150

--- Stream Data ---

No.	Component	MW	LP Oil mol %	Flash Oil mol %	Sale Oil mol %	Flash Gas mol %	W&S Gas mol %	Total Emissions mol %
1	H2S	34.80	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	O2	32.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	CO2	44.01	0.0800	0.0260	0.0019	1.6687	3.7141	1.9960
4	N2	28.01	0.0200	0.0009	0.0000	0.5806	0.1431	0.5106
5	C1	16.04	2.6500	0.3584	0.0006	70.0127	55.2139	67.6445
6	C2	30.07	0.3900	0.1808	0.0675	6.5394	17.5551	8.3023
7	C3	44.10	0.9200	0.6987	0.6426	7.4245	9.3012	7.7249
8	i-C4	58.12	0.9800	0.8895	0.8705	3.6407	3.7936	3.6652
9	n-C4	58.12	1.4700	1.3846	1.3670	3.9809	4.0791	3.9966
10	i-C5	72.15	2.0500	2.0455	2.0445	2.1818	2.2002	2.1848
11	n-C5	72.15	2.1600	2.1750	2.1779	1.7185	1.7306	1.7205
12	C6	86.16	3.4500	3.5410	3.5590	0.7751	0.7794	0.7758
13	C7	100.20	7.9400	8.1900	8.2396	0.5898	0.5935	0.5904
14	C8	114.23	9.6900	10.0120	10.0758	0.2250	0.2267	0.2252
15	C9	128.28	6.5600	6.7814	6.8253	0.0521	0.0557	0.0527
16	C10+	301.00	56.3900	58.3083	58.6887	0.0000	0.0000	0.0000
17	Benzene	78.11	0.4300	0.4422	0.4447	0.0705	0.0709	0.0705
18	Toluene	92.13	1.1000	1.1357	1.1428	0.0501	0.0505	0.0502
19	E-Benzene	106.17	0.1000	0.1034	0.1040	0.0015	0.0015	0.0015
20	Xylenes	106.17	0.9000	0.9302	0.9362	0.0116	0.0117	0.0116
21	n-C6	86.18	2.7200	2.7963	2.8114	0.4764	0.4791	0.4768
22	224Trimethylp	114.24	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	MW		209.36	215.58	216.79	26.68	29.40	27.11
	Stream Mole Ratio		1.0000	0.9671	0.9608	0.0329	0.0063	0.0392
	Heating Value	[BTU/SCF]				1526.60	1629.68	1543.10
	Gas Gravity	[Gas/Air]				0.92	1.01	0.94
	Bubble Pt. @ 100F	[psia]	97.56	18.02	5.25			
	RVP @ 100F	[psia]	13.38	5.45	3.98			
	Spec. Gravity @ 100F		0.724	0.726	0.726			

* Project Setup Information *

Project File : \\tsclient\C\Users\jguest\Desktop\PetroShale\Horse Camp 2-11H & 101-11H and Horse Ca
 Flowsheet Selection : Oil Tank with Separator
 Calculation Method : RVP Distillation
 Control Efficiency : 98.0%
 Known Separator Stream : Geographical Region
 Geographical Region : All Regions in US
 Entering Air Composition : No

Well Name : PetroShale (US), Inc.
 Well ID : Horse Camp 101-11H
 Date : 2019.05.17

* Data Input *

Separator Pressure : 64.00[psig]
 Separator Temperature : 74.00[F]
 Ambient Pressure : 14.70[psia]
 Ambient Temperature : 70.00[F]
 C10+ SG : 0.8660
 C10+ MW : 301.00

--- Low Pressure Oil -----

No.	Component	mol %
1	H2S	0.0000
2	O2	0.0000
3	CO2	0.0800
4	N2	0.0200
5	C1	2.6500
6	C2	0.3900
7	C3	0.9200
8	i-C4	0.9800
9	n-C4	1.4700
10	i-C5	2.0500
11	n-C5	2.1600
12	C6	3.4500
13	C7	7.9400
14	C8	9.6900
15	C9	6.5600
16	C10+	56.3900
17	Benzene	0.4300
18	Toluene	1.1000
19	E-Benzene	0.1000
20	Xylenes	0.9000
21	n-C6	2.7200
22	224Trimethylp	0.0000

--- Sales Oil -----

Production Rate : 54.2[bbl/day]
 Days of Annual Operation : 365 [days/year]
 API Gravity : 40.0
 Reid Vapor Pressure : 3.90[psia]

* Calculation Results *

--- Emission Summary -----

Item	Uncontrolled [ton/yr]	Uncontrolled [lb/hr]	Controlled [ton/yr]	Controlled [lb/hr]
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Total HAPs	0.270	0.062	0.005	0.001
Total HC	13.259	3.027	0.265	0.061
VOCs, C2+	7.744	1.768	0.155	0.035
VOCs, C3+	6.476	1.479	0.130	0.030

Uncontrolled Recovery Info.

Vapor	1.0600	[MSCFD]
HC Vapor	1.0300	[MSCFD]
GOR	19.56	[SCF/bbl]

--- Emission Composition ---

No	Component	Uncontrolled [ton/yr]	Uncontrolled [lb/hr]	Controlled [ton/yr]	Controlled [lb/hr]
1	H2S	0.000	0.000	0.000	0.000
2	O2	0.000	0.000	0.000	0.000
3	CO2	0.446	0.102	0.446	0.102
4	N2	0.073	0.017	0.073	0.017
5	C1	5.515	1.259	0.110	0.025
6	C2	1.269	0.290	0.025	0.006
7	C3	1.731	0.395	0.035	0.008
8	i-C4	1.083	0.247	0.022	0.005
9	n-C4	1.181	0.270	0.024	0.005
10	i-C5	0.801	0.183	0.016	0.004
11	n-C5	0.631	0.144	0.013	0.003
12	C6	0.331	0.076	0.007	0.002
13	C7	0.291	0.066	0.006	0.001
14	C8	0.127	0.029	0.003	0.001
15	C9	0.033	0.008	0.001	0.000
16	C10+	0.000	0.000	0.000	0.000
17	Benzene	0.028	0.006	0.001	0.000
18	Toluene	0.023	0.005	0.000	0.000
19	E-Benzene	0.001	0.000	0.000	0.000
20	Xylenes	0.006	0.001	0.000	0.000
21	n-C6	0.209	0.048	0.004	0.001
22	224Trimethylp	0.000	0.000	0.000	0.000
	Total	13.779	3.146	0.276	0.063

--- Stream Data ---

No.	Component	MW	LP Oil mol %	Flash Oil mol %	Sale Oil mol %	Flash Gas mol %	W&S Gas mol %	Total Emissions mol %
1	H2S	34.80	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	O2	32.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	CO2	44.01	0.0800	0.0260	0.0019	1.6687	3.7141	1.9960
4	N2	28.01	0.0200	0.0009	0.0000	0.5806	0.1431	0.5106
5	C1	16.04	2.6500	0.3584	0.0006	70.0127	55.2139	67.6445
6	C2	30.07	0.3900	0.1808	0.0675	6.5394	17.5551	8.3023
7	C3	44.10	0.9200	0.6987	0.6426	7.4245	9.3012	7.7249
8	i-C4	58.12	0.9800	0.8895	0.8705	3.6407	3.7936	3.6652
9	n-C4	58.12	1.4700	1.3846	1.3670	3.9809	4.0791	3.9966
10	i-C5	72.15	2.0500	2.0455	2.0445	2.1818	2.2002	2.1848
11	n-C5	72.15	2.1600	2.1750	2.1779	1.7185	1.7306	1.7205
12	C6	86.16	3.4500	3.5410	3.5590	0.7751	0.7794	0.7758
13	C7	100.20	7.9400	8.1900	8.2396	0.5898	0.5935	0.5904
14	C8	114.23	9.6900	10.0120	10.0758	0.2250	0.2267	0.2252
15	C9	128.28	6.5600	6.7814	6.8253	0.0521	0.0557	0.0527
16	C10+	301.00	56.3900	58.3083	58.6887	0.0000	0.0000	0.0000
17	Benzene	78.11	0.4300	0.4422	0.4447	0.0705	0.0709	0.0705
18	Toluene	92.13	1.1000	1.1357	1.1428	0.0501	0.0505	0.0502
19	E-Benzene	106.17	0.1000	0.1034	0.1040	0.0015	0.0015	0.0015
20	Xylenes	106.17	0.9000	0.9302	0.9362	0.0116	0.0117	0.0116
21	n-C6	86.18	2.7200	2.7963	2.8114	0.4764	0.4791	0.4768
22	224Trimethylp	114.24	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	MW		209.36	215.58	216.79	26.68	29.40	27.11
	Stream Mole Ratio		1.0000	0.9671	0.9608	0.0329	0.0063	0.0392
	Heating Value	[BTU/SCF]				1526.60	1629.68	1543.10
	Gas Gravity	[Gas/Air]				0.92	1.01	0.94
	Bubble Pt. @ 100F	[psia]	97.56	18.02	5.25			

RVP @ 100F	[psia]	13.38	5.45	3.98
Spec. Gravity @ 100F		0.724	0.726	0.726

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Identification and Physical Characteristics

Identification

User Identification:	Produced Water Tank
City:	Mandaree
State:	North Dakota
Company:	PetroShale (US), Inc.
Type of Tank:	Vertical Fixed Roof Tank
Description:	Produced Water Tank

Tank Dimensions

Shell Height (ft):	20.00
Diameter (ft):	12.00
Liquid Height (ft) :	17.50
Avg. Liquid Height (ft):	17.50
Volume (gallons):	16,074.56
Turnovers:	184.27
Net Throughput(gal/yr):	2,962,097.59
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Cone
Height (ft)	1.00
Slope (ft/ft) (Cone Roof)	0.17

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meteorological Data used in Emissions Calculations: Williston, North Dakota (Avg Atmospheric Pressure = 13.82 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

Produced Water Tank - Vertical Fixed Roof Tank
Mandaree, North Dakota

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F)			Liquid Bulk Temp (deg F)	Vapor Pressure (psia)			Vapor Mol. Weight	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
		Avg.	Min.	Max.		Avg.	Min.	Max.					
Produced Water	Jan	27.65	23.33	31.96	41.45	0.0802	0.0675	0.0951	20.6773			18.88	
Crude oil (RVP 5)		1.4615				1.3261	1.6079	50.0000	50.0000	0.0500	0.2009	207.00	Option 4: RVP=5
Water		0.0739				0.0617	0.0882	18.0200	18.0200	0.9500	0.7991	18.02	Option 2: A=8.10765, B=1750.286, C=235
Produced Water	Feb	31.17	26.51	35.84	41.45	0.0922	0.0766	0.1106	20.5196			18.88	
Crude oil (RVP 5)		1.5803				1.4246	1.7497	50.0000	50.0000	0.0500	0.1905	207.00	Option 4: RVP=5
Water		0.0854				0.0705	0.1031	18.0200	18.0200	0.9500	0.8095	18.02	Option 2: A=8.10765, B=1750.286, C=235
Produced Water	Mar	37.19	31.92	42.46	41.45	0.1164	0.0949	0.1422	20.2764			18.88	
Crude oil (RVP 5)		1.8012				1.6063	2.0149	50.0000	50.0000	0.0500	0.1740	207.00	Option 4: RVP=5
Water		0.1087				0.0880	0.1336	18.0200	18.0200	0.9500	0.8260	18.02	Option 2: A=8.10765, B=1750.286, C=235
Produced Water	Apr	44.20	37.87	50.52	41.45	0.1517	0.1195	0.1913	20.0292			18.88	
Crude oil (RVP 5)		2.0894				1.8277	2.3807	50.0000	50.0000	0.0500	0.1568	207.00	Option 4: RVP=5
Water		0.1428				0.1117	0.1813	18.0200	18.0200	0.9500	0.8432	18.02	Option 2: A=8.10765, B=1750.286, C=235
Produced Water	May	49.98	43.10	56.85	41.45	0.1876	0.1456	0.2400	19.8505			18.88	
Crude oil (RVP 5)		2.3543				2.0422	2.7040	50.0000	50.0000	0.0500	0.1442	207.00	Option 4: RVP=5
Water		0.1777				0.1369	0.2287	18.0200	18.0200	0.9500	0.8558	18.02	Option 2: A=8.10765, B=1750.286, C=235
Produced Water	Jun	54.43	47.20	61.65	41.45	0.2202	0.1695	0.2839	19.7264			18.88	
Crude oil (RVP 5)		2.5765				2.2242	2.9724	50.0000	50.0000	0.0500	0.1352	207.00	Option 4: RVP=5
Water		0.2094				0.1601	0.2716	18.0200	18.0200	0.9500	0.8648	18.02	Option 2: A=8.10765, B=1750.286, C=235
Produced Water	Jul	57.24	49.54	64.95	41.45	0.2433	0.1846	0.3180	19.6535			18.88	
Crude oil (RVP 5)		2.7253				2.3335	3.1685	50.0000	50.0000	0.0500	0.1299	207.00	Option 4: RVP=5
Water		0.2320				0.1748	0.3049	18.0200	18.0200	0.9500	0.8701	18.02	Option 2: A=8.10765, B=1750.286, C=235
Produced Water	Aug	55.94	48.47	63.41	41.45	0.2324	0.1776	0.3017	19.6867			18.88	
Crude oil (RVP 5)		2.6556				2.2828	3.0759	50.0000	50.0000	0.0500	0.1324	207.00	Option 4: RVP=5
Water		0.2213				0.1679	0.2890	18.0200	18.0200	0.9500	0.8676	18.02	Option 2: A=8.10765, B=1750.286, C=235
Produced Water	Sep	49.76	43.18	56.34	41.45	0.1861	0.1460	0.2357	19.8568			18.88	
Crude oil (RVP 5)		2.3441				2.0455	2.6769	50.0000	50.0000	0.0500	0.1446	207.00	Option 4: RVP=5
Water		0.1763				0.1373	0.2245	18.0200	18.0200	0.9500	0.8554	18.02	Option 2: A=8.10765, B=1750.286, C=235
Produced Water	Oct	44.08	38.23	49.93	41.45	0.1510	0.1212	0.1873	20.0330			18.88	
Crude oil (RVP 5)		2.0844				1.8418	2.3521	50.0000	50.0000	0.0500	0.1571	207.00	Option 4: RVP=5
Water		0.1422				0.1133	0.1774	18.0200	18.0200	0.9500	0.8429	18.02	Option 2: A=8.10765, B=1750.286, C=235
Produced Water	Nov	35.80	31.32	40.28	41.45	0.1104	0.0928	0.1309	20.3298			18.88	
Crude oil (RVP 5)		1.7481				1.5856	1.9239	50.0000	50.0000	0.0500	0.1776	207.00	Option 4: RVP=5
Water		0.1029				0.0859	0.1227	18.0200	18.0200	0.9500	0.8224	18.02	Option 2: A=8.10765, B=1750.286, C=235
Produced Water	Dec	29.47	25.33	33.61	41.45	0.0862	0.0731	0.1014	20.5944			18.88	
Crude oil (RVP 5)		1.5219				1.3873	1.6669	50.0000	50.0000	0.0500	0.1954	207.00	Option 4: RVP=5
Water		0.0796				0.0671	0.0942	18.0200	18.0200	0.9500	0.8046	18.02	Option 2: A=8.10765, B=1750.286, C=235

Actual Annual Emissions: Produced Water Tanks

05/17/2019

ED_004016P_00013086-00123

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

Produced Water Tank - Vertical Fixed Roof Tank
Mandaree, North Dakota

Month:	January	February	March	April	May	June	July	August	September	October	November	December
Standing Losses (lb):	0.1029	0.1149	0.1795	0.2697	0.3714	0.4412	0.5372	0.4975	0.3405	0.2549	0.1379	0.1047
Vapor Space Volume (cu ft):	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425
Vapor Density (lb/cu ft):	0.0003	0.0004	0.0004	0.0006	0.0007	0.0008	0.0009	0.0008	0.0007	0.0006	0.0004	0.0003
Vapor Space Expansion Factor:	0.0331	0.0361	0.0415	0.0511	0.0565	0.0602	0.0650	0.0627	0.0538	0.0469	0.0345	0.0316
Vented Vapor Saturation Factor:	0.9881	0.9863	0.9828	0.9777	0.9726	0.9680	0.9647	0.9663	0.9728	0.9778	0.9837	0.9872
Tank Vapor Space Volume:												
Vapor Space Volume (cu ft):	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425	320.4425
Tank Diameter (ft):	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000
Vapor Space Outage (ft):	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333
Tank Shell Height (ft):	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000	20.0000
Average Liquid Height (ft):	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000
Roof Outage (ft):	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333
Roof Outage (Cone Roof)												
Roof Outage (ft):	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333	0.3333
Roof Height (ft):	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Roof Slope (ft/ft):	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700
Shell Radius (ft):	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000	6.0000
Vapor Density												
Vapor Density (lb/cu ft):	0.0003	0.0004	0.0004	0.0006	0.0007	0.0008	0.0009	0.0008	0.0007	0.0006	0.0004	0.0003
Vapor Molecular Weight (lb/lb-mole):	20.6773	20.5196	20.2764	20.0292	19.8505	19.7264	19.6535	19.6867	19.8568	20.0330	20.3298	20.5944
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0802	0.0922	0.1164	0.1517	0.1876	0.2202	0.2433	0.2324	0.1861	0.1510	0.1104	0.0862
Daily Avg. Liquid Surface Temp. (deg. R):	487.3186	490.8447	496.8602	503.8659	509.6452	514.0987	516.9127	515.6102	509.4312	503.7493	495.4708	489.1381
Daily Average Ambient Temp. (deg. F):	8.9000	16.0500	28.4000	43.1500	55.2500	64.7000	70.6500	68.7000	56.2500	44.7500	27.1500	13.2000
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731	10.731
Liquid Bulk Temperature (deg. R):	501.1192	501.1192	501.1192	501.1192	501.1192	501.1192	501.1192	501.1192	501.1192	501.1192	501.1192	501.1192
Tank Paint Solar Absorptance (Shell):	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	388.0000	671.0000	1,104.0000	1,488.0000	1,827.0000	2,047.0000	2,193.0000	1,862.0000	1,340.0000	877.0000	479.0000	334.0000
Vapor Space Expansion Factor												
Vapor Space Expansion Factor:	0.0331	0.0361	0.0415	0.0511	0.0565	0.0602	0.0650	0.0627	0.0538	0.0469	0.0345	0.0316
Daily Vapor Temperature Range (deg. R):	17.2549	18.6740	21.0950	25.2989	27.4885	28.8957	30.8147	29.8871	26.3224	23.3985	17.9040	16.5658
Daily Vapor Pressure Range (psia):	0.0276	0.0339	0.0472	0.0718	0.0944	0.1144	0.1333	0.1241	0.0897	0.0661	0.0382	0.0283
Breather Vent Press. Setting Range(psia):	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0802	0.0922	0.1164	0.1517	0.1876	0.2202	0.2433	0.2324	0.1861	0.1510	0.1104	0.0862
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0675	0.0766	0.0949	0.1195	0.1456	0.1695	0.1846	0.1776	0.1460	0.1212	0.0928	0.0731
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0951	0.1106	0.1422	0.1913	0.2400	0.2839	0.3180	0.3017	0.2357	0.1873	0.1309	0.1014
Daily Avg. Liquid Surface Temp. (deg R):	487.3186	490.8447	496.8602	503.8659	509.6452	514.0987	516.9127	515.6102	509.4312	503.7493	495.4708	489.1381
Daily Min. Liquid Surface Temp. (deg R):	483.0049	486.1762	491.5864	497.5412	502.7731	506.8747	509.2091	508.1384	502.8506	497.8997	490.9948	484.9966
Daily Max. Liquid Surface Temp. (deg R):	491.6323	495.5132	502.1340	510.1906	516.5173	521.3226	524.6164	523.0820	516.0118	509.5990	499.9468	493.2796
Daily Ambient Temp. Range (deg. R):	21.4000	21.5000	22.0000	25.3000	26.1000	26.6000	28.3000	29.2000	27.7000	26.7000	21.7000	20.8000
Vented Vapor Saturation Factor												
Vented Vapor Saturation Factor:	0.9881	0.9863	0.9828	0.9777	0.9726	0.9680	0.9647	0.9663	0.9728	0.9778	0.9837	0.9872
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0802	0.0922	0.1164	0.1517	0.1876	0.2202	0.2433	0.2324	0.1861	0.1510	0.1104	0.0862
Vapor Space Outage (ft):	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333	2.8333
Working Losses (lb):	2.4089	2.7480	3.4286	4.4120	5.4080	6.3090	6.9456	6.6441	5.3678	4.3938	3.2590	2.5788

Actual Annual Emissions: Produced Water Tanks

05/17/2019

Vapor Molecular Weight (lb/lb-mole):	20.6773	20.5196	20.2764	20.0292	19.8505	19.7264	19.6535	19.6867	19.8568	20.0330	20.3298	20.5944
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0802	0.0922	0.1164	0.1517	0.1876	0.2202	0.2433	0.2324	0.1861	0.1510	0.1104	0.0862
Net Throughput (gal/mo.):	246,841.4658	246,841.4658	246,841.4658	246,841.4658	246,841.4658	246,841.4658	246,841.4658	246,841.4658	246,841.4658	246,841.4658	246,841.4658	246,841.4658
Annual Turnovers:	184.2724	184.2724	184.2724	184.2724	184.2724	184.2724	184.2724	184.2724	184.2724	184.2724	184.2724	184.2724
Turnover Factor:	0.3295	0.3295	0.3295	0.3295	0.3295	0.3295	0.3295	0.3295	0.3295	0.3295	0.3295	0.3295
Maximum Liquid Volume (gal):	16,074.5628	16,074.5628	16,074.5628	16,074.5628	16,074.5628	16,074.5628	16,074.5628	16,074.5628	16,074.5628	16,074.5628	16,074.5628	16,074.5628
Maximum Liquid Height (ft):	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000	17.5000
Tank Diameter (ft):	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000	12.0000
Working Loss Product Factor:	0.7500	0.7500	0.7500	0.7500	0.7500	0.7500	0.7500	0.7500	0.7500	0.7500	0.7500	0.7500
Total Losses (lb):	2.5118	2.8630	3.6081	4.6818	5.7794	6.7502	7.4829	7.1417	5.7083	4.6487	3.3969	2.6835

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: January, February, March, April, May, June, July, August, September, October, November, December

Produced Water Tank - Vertical Fixed Roof Tank
Mandaree, North Dakota

Components	Losses(lbs)		
	Working Loss	Breathing Loss	Total Emissions
Produced Water	53.90	3.35	57.26
Crude oil (RVP 5)	8.26	0.50	8.76
Water	45.64	2.85	48.50

Actual Annual Emissions: Produced Water Tanks

05/17/2019

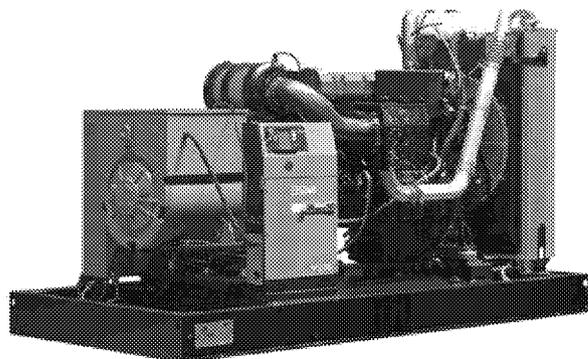


V500UC2

Tiers 2
Engine VOLVO , TAD1641GE
Alternator LEROY SOMER , LSA472M7

STANDARD FEATURES

- Electronic governor
- Mechanically welded chassis with antivibration suspension
- Power circuit breaker
- Radiator for wiring T° of 50°C [122°F] max with mechanical fan
- Protective grille for fan and rotating parts
- 9dB(A) silencer supplied separately
- Charged DC starting battery with electrolyte
- 24 V charging alternator and starter
- Supplied with oil and coolant -30°C
- User manual and commissioning guide



Voltage	Power ESP kWe/kVA	Power PRP kWe/kVA	Standby Amps	Dimensions	Weight
480/277	500 / 625	455 / 568	752	Length: 3470mm [137in] Width: 1500mm [59in] Height: 2043mm [80in]	3620kg [7981 lbs] Net 4160kg [9171 lbs] Gross
440/254	500 / 625	455 / 568	820		
380/220	500 / 625	455 / 568	950		
240/120	500 / 625	455 / 568	1504		
220/127	500 / 625	455 / 568	1640		
208/120	480 / 600	436 / 545	1665		

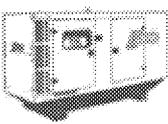
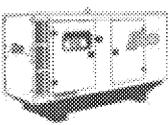
POWER DEFINITION

PRP : Prime Power is available for an unlimited number of annual operating hours in variable load applications, in accordance with ISO 8528-1. A 10% overload capability is available for a period of 1 hour within 12-hour period of operation, in accordance with ISO 3046-1 –

ESP : The standby power rating is applicable for supplying emergency power in variable load applications in accordance with ISO 8528-1. Overload is not allowed.

TERM OF USE

Standard reference conditions 40 °C Air Inlet Temp, 1600 m A.S.L. 60 % relative humidity. All engine performance data based on the above mentioned maximum continuous ratings.

Type	dB(A)@1m	dB(A)@7m	Dimensions	Weight	Tank	
	M229	85	75	Length: 5031mm [198in]	4870kg [10737lbs] Net	500 L
				Width: 1560mm [61in] Height: 2435mm [96in]	5410kg [11927lbs] Gross	
	M229-DW	85	75	Length: 5083mm [200in]	5590kg [12324lbs] Net	1770 L
				Width: 1560mm [61in] Height: 2700mm [106in]	7240kg [15961lbs] Gross	

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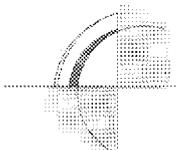
ENGINE SPECIFICATIONS

STANDARD FEATURES	Manufacturer / Model	VOLVO TAD1641GE , 4-strokes, Turbo , Air/Air DC 6 X
	Cylinder Arrangement	L
	Displacement	16.12L [983.7C.I.]
	Bore and Stroke	144mm [5.7in.] X 165mm [6.5in.]
	Compression ratio	16.5 : 1
	Rated RPM	1800 Rpm
	Piston Speed	9.9m/s [32.5ft./s]
	Max. stand by Power at rated RPM	546kW [732BHP]
	Frequency regulation, steady state	+/- 0.5%
	BMEP	20.05bar [291psi]
Governor : type	ELEC	
EXHAUST SYSTEM	Exhaust temperature	479°C [894°F]
	Exhaust gas flow	1840L/s [3899cfm]
	Max back pressure	1000mm CE [39in. WG]
FUEL SYSTEM	110% (Stand By power)	137.97L/h [36.5gal/hr]
	100% (of the Prime Power)	120.73L/h [31.9gal/hr]
	75% (of the Prime Power)	88.79L/h [23.5gal/hr]
	50% (of the Prime Power)	59.78L/h [15.8gal/hr]
	Max. fuel pump flow	190L/h [50.2gal/hr]
OIL SYSTEM	Total oil capacity w/filters	48L [12.7gal]
	Oil Pressure low idle	0.7bar [10.1psi]
	Oil Pressure rated RPM	6.5bar [94.2psi]
	Oil consumption 100% load	0.11L/h [0.029gal/hr]
	Oil capacity carter	42L [11.1gal]
THERMAL BALANCE	Heat rejection to exhaust	442kW [25132Btu/mn]
	Radiated heat to ambient	24kW [1365Btu/mn]
	Heat rejection to coolant	231kW [13135Btu/mn]
AIR INTAKE	Max. intake restriction	500mm CE [20in. WG]
	Engine air flow	763L/s [1617cfm]
COOLANT SYSTEM	Radiator & engine capacity	60L [15.9gal]
	Max water temperature	103°C [217°F]
	Outlet water temperature	93°C [199°F]
	Fan power	19 kW
	Fan air flow w/o restriction	13.5m ³ /s [28608cfm]
	Available restriction on air flow	25mm CE [1.0in. WG]
	Type of coolant	Glycol-Ethylene
	Thermostat	86-96 °C
EMISSIONS LEVEL	PM	0.08 gr/bhp/h
	CO	0.51 gr/bhp/h
	Nox	3.87 gr/bhp/h
	HC	0.12 gr/bhp/h

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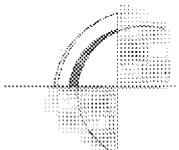
ALTERNATOR SPECIFICATIONS

GENERAL DATAS	Manufacturer	LEROY SOMER
	Type	LSA472M7
	Number of phase	3
	Power factor (Cos Phi)	0.8
	Altitude	< 1000 m
	Overspeed	2250 rpm
	Pole : number	4
	Exciter type	SHUNT
	Insulation : class, temperature rise	H / H
	Voltage regulator	R230
	Total harmonics (TGH/THC)	< 2%
	Wave form : NEMA = TIF – TGH/THC	< 50
	Wave form : CEI = FHT – TGH/THC	< 2%
	Bearing : number	1
	Coupling	Direct
	Voltage regulation 0 to 100% load	+/- 0.5%
	Recovery time (20% Volt dip) ms SKVA with 90% of nominal sustained voltage (at 0.4PF)	500 ms N/A
OTHER DATAS	Continuous nominal rating @ 40°C	625 kVA
	Standby rating @ 27°C	700 kVA
	Efficiencies @ 4/4 load	94.5 %
	Air flow	1.1m3/s [2330.76cfm]
	Short circuit ratio;50 (Kcc)	0.4
	Direct axis synchro reactance unsaturated (Xd)	319 %
	Quadra axis synchro reactance unsaturated (Xq)	191 %
	Open circuit time constant;50 (T'do)	1930 ms
	Direct axis transient reactance saturated (X'd)	16.5 %
	Short circuit transient time constant (T'd)	100 ms
	Direct axis subtransient reactance saturated (X''d)	13.2 %
	Subtransient time constant (T''d)	10 ms
	Quadra axis subtransient reactance saturated (X''q)	17.5 %
	Zero sequence reactance unsaturated (Xo)	0.1 %
	Negative sequence reactance saturated (X2)	15.4 %
	Armature time constant (Ta)	15 ms
	No load excitation current (io)	1 A
	Full load excitation current (ic)	3.7 A
	Full load excitation voltage (uc)	37 V
	Recovery time (Delta U = 20% transitoire)	500 ms
Motor start (Delta = 20% perm. Or 50% trans.)	1318 kVA	
Transient dip (4/4 charge) – PF : 1.8 AR	15 %	
No load losses	10.08 kW	
Heat rejection	28.63 kW	

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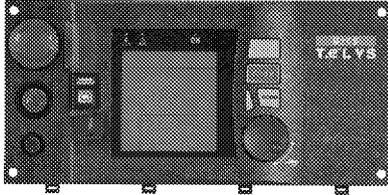
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CONTROL PANEL

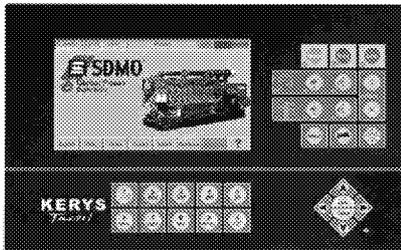
Standard



TELYS

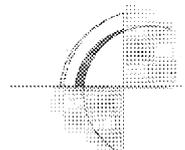
Specifications :
Frequency meter, Ammeter, Voltmeter
Alarms and faults Oil pressure, water temperature, No start-up, Overspeed, Min/max alternator, Min/max battery voltage, Low fuel level, Emergency stop
Engine parameters Hours counter, Oil pressure, Water temperature, Engine speed, Battery voltage, Fuel level

Option



KERYS

Specifications :
Frequency meter, Ammeter, Voltmeter
Alarms and faults Oil pressure, water temperature, No start-up, Overspeed, Min/max alternator, Min/max battery voltage, Low fuel level, Emergency stop
Engine parameters Hours counter, Oil pressure, Water temperature, Engine speed, Battery voltage, Fuel level
Additional specifications Website, Troubleshooting, Assistance and Maintenance, Plotting and logging, Load impact, 8 configurations available, Compliance with international standards...

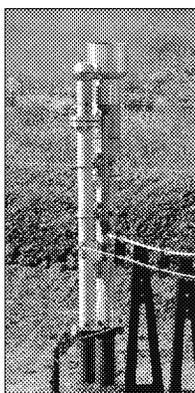


Steffes is committed to working with our customers to provide the simplest, most efficient, and most reliable solutions for flaring requirements. Our flares are designed to help operators meet the EPA 40 CFR §60.18 requirements, including our patent pending variable orifice design.

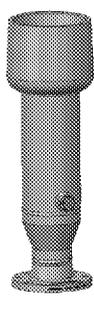
Data is for reference only. Call Steffes Technical support for more specific information.

Flare Tip Model		Technology	Back Pressure*	Rated Flow** ¹ <small>MEETING 40 CFR 60.18</small>	Max Flow Capacity	Power Required	Pipe Connections	Typical Installations	
								Produced Gas	Tank Gas
High Pressure	SHP-6	Variable Orifice	5.5 - 10 PSI	1.1 MMSCFD	2.2 MMSCFD* ²	No	4"	X	
	SHC-6		4 - 6 PSI	3.0 MMSCFD	10.0 MMSCFD* ²	No	4"	X	
Low Pressure	SVG-3B4	Variable Orifice	3 - 5 OSI	106 MSCFD	750 MSCFD* ³	No	3"		X
	SVG-3D4		4 - 6 OSI	106 MSCFD	750 MSCFD* ³	No	3"		X
	SVG-3D8		7 - 10 OSI	120 MSCFD	750 MSCFD* ³	No	3"		X
	SAA-2	Air Assist	0 - 3 OSI	200 MSCFD	See chart 4	120 v	3"		X
	SAA-4		0 - 1 OSI	600 MSCFD	See chart 5	480 V 3 Phase	4"		X
8" High Capacity Series	8" Dual SHC-6	Variable Orifice	4-6 PSI	6.0 MMSCFD	20 MMSCFD	No	8"	X	
	8" Tri SHC-6		4-6 PSI	9.0 MMSCFD	30 MMSCFD	No	8"	X	
	8" Quad SHC-6		4-6 PSI	12.0 MMSCFD	40 MMSCFD	No	8"	X	
Pilot ⁴	SPL-1	Pilot	8 PSI	264 SCFD	N/A	Spark System Required	3/8" Compression	X or Propane	

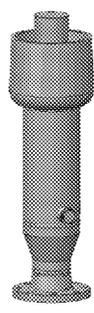
*Measured at flare tip. **Rated Flow* is the flow rate used by independent third parties to confirm Steffes' flare compliance with the prescriptive provisions of 40 CFR 60.18. Gas flow rates that do not exceed these values can be assumed to comply with all relevant EPA flare performance requirements. **Max Flow Capacity* is the highest flow rate allowed by Steffes for use in each specified flare. Flow rates above the "Max Flow Rate" may void warranties. ** All low pressure flares can meet requirements of 40 CFR 60.18 if smokeless operation is confirmed by Method 22. Also will need to be evaluated for flame stability, re-light capability, and radiation. ** Pilot can run at 6 - 10 PSI, Flow Rate will vary by pressure and gas composition.



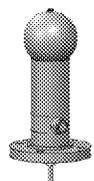
VARIABLE ORIFICE FLARES



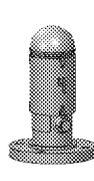
SHP-6



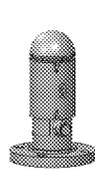
SHC-6



SVG-3B4

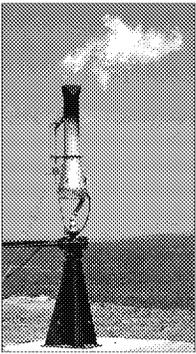


SVG-3D4



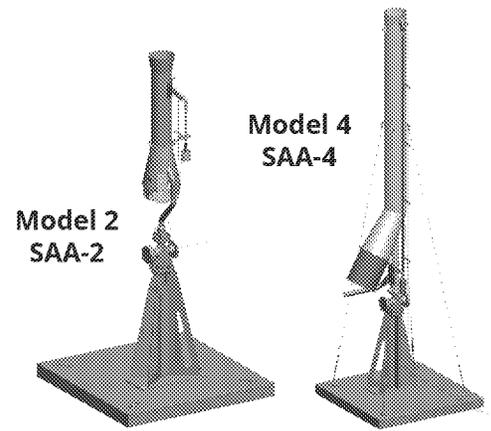
SVG-3D8

The Steffes Variable Orifice Flares give optimum system performance over a wide range of gas flows for both high pressure and low pressure gases. Configure your flare system with singular or multiple flare tips to maximize performance. Models SHP - 6, SHC - 6, SVG - 3B4, SVG - 3D4, and SVG - 3D8.



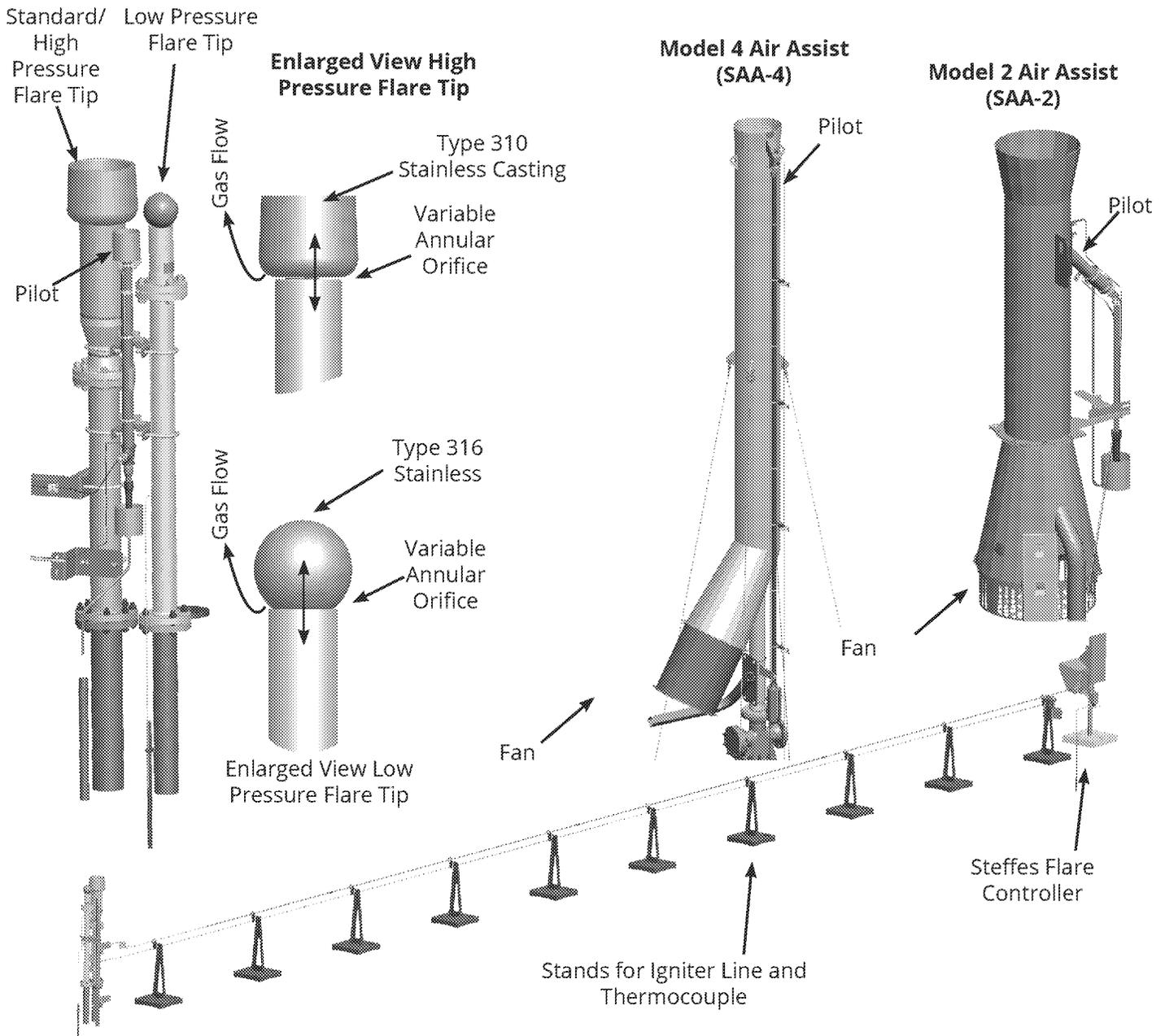
AIR ASSIST FLARES

The Steffes Air Assist Flares burn low pressure gas over a wide range of flow rates. Low pressure gas is mixed with air from a variable speed fan to provide a clean burn. Model 2 (SAA - 2) and Model 4 (SAA - 4).



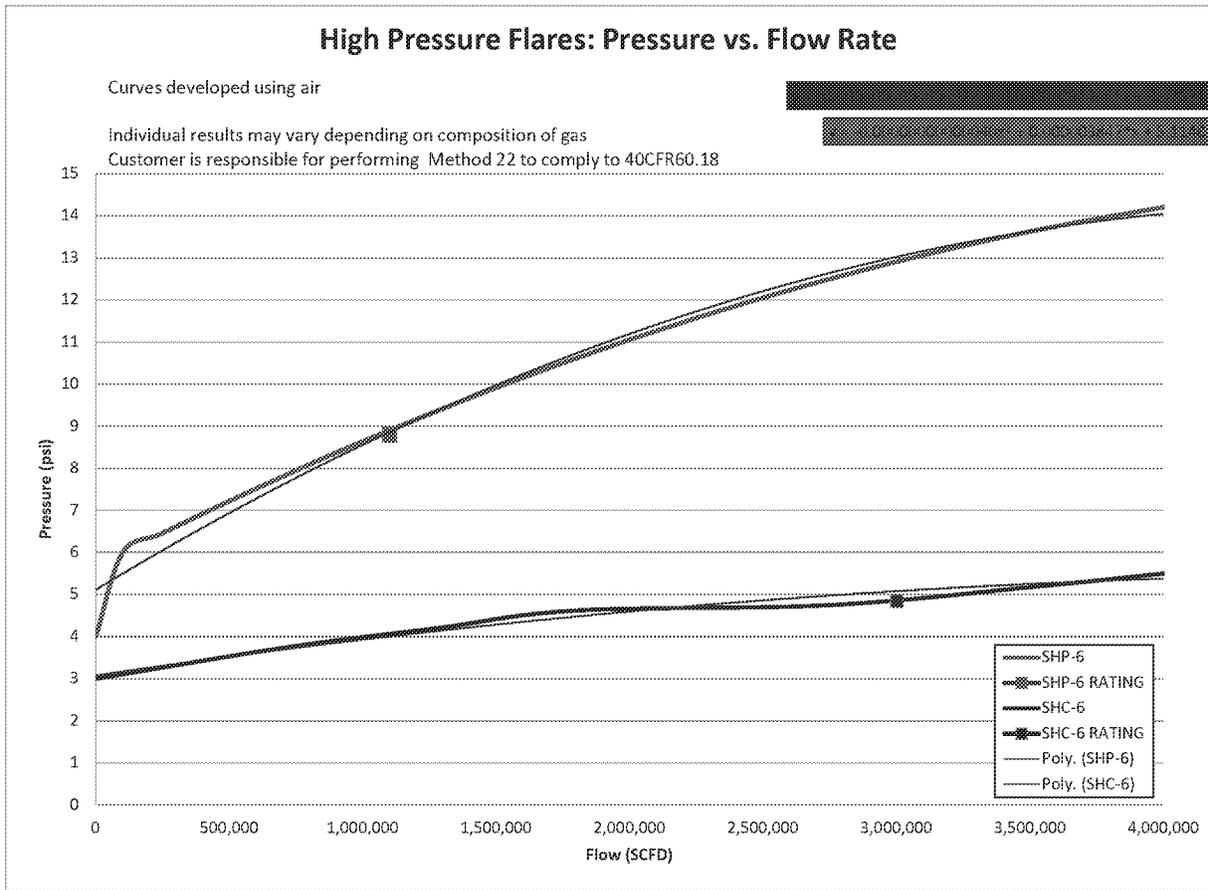
VARIABLE ORIFICE FLARES

Modular Design: Three (3) Pieces can be used together or separately



AIR ASSIST FLARES

CHART 1



SHP-6

Maximum Rate Tested by 3 rd Party	1.1 MMSCFD
Minimum Rate Tested	0.05 MMSCFD

SHC-6

Maximum Rate Tested by 3 rd Party	3.0 MMSCFD
Minimum Rate Tested	0.05 MMSCFD

GAS CHARACTERISTICS (SEPARATOR GAS) DURING 3RD PARTY TESTING

Specific Gravity at 40 psig and 100F	0.89*
Gross Heating Value	1550* BTU/SCF

*Pressure was measured at the test port on tip during third party testing.

*Data is from third party test report. Flare is designed to operate with 1100 to 2500 BTU/SCF gas. Performance can be affected by specific gas composition.

*Flares are able to handle more flow than the current ratings allow, however "Max Flow Capacity" is the highest flow rate allowed by Steffes for use in each specified flare. Flow rates above the "Max Flow Rate" may void warranties.

*Data is for reference only.

*Smokeless operation is achieved by building pressure in the flare, and the Minimum Rate is defined as typical flow required to begin building pressure in flare barrel. Minimum Rate can be affected by conditions restricting the proper seating of the translating tip and the barrel resulting in lower operating pressures. Flares operating at pressures less than those shown on chart can still meet the requirements of 40 CFR 60.18 if verification of smokeless operation is confirmed by Method 22.

CHART 2

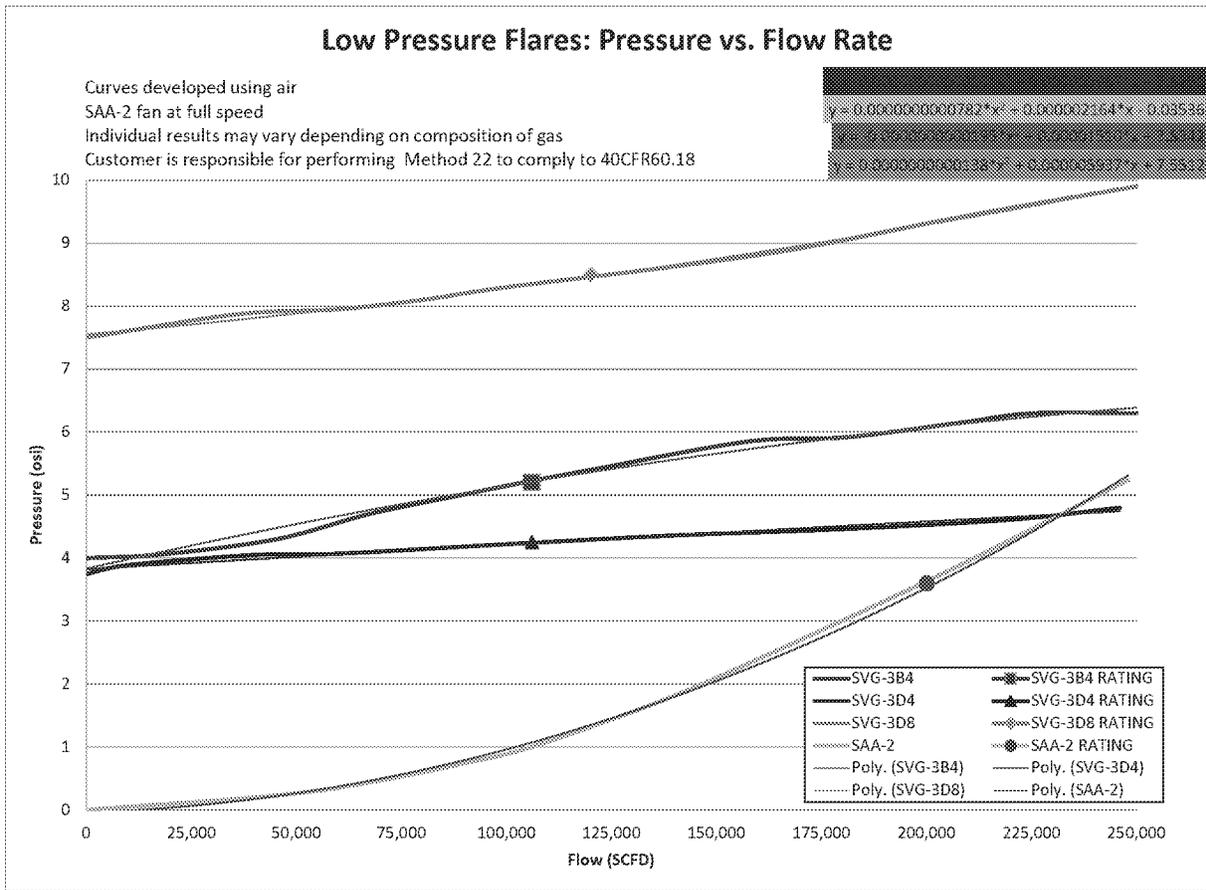


CHART 3

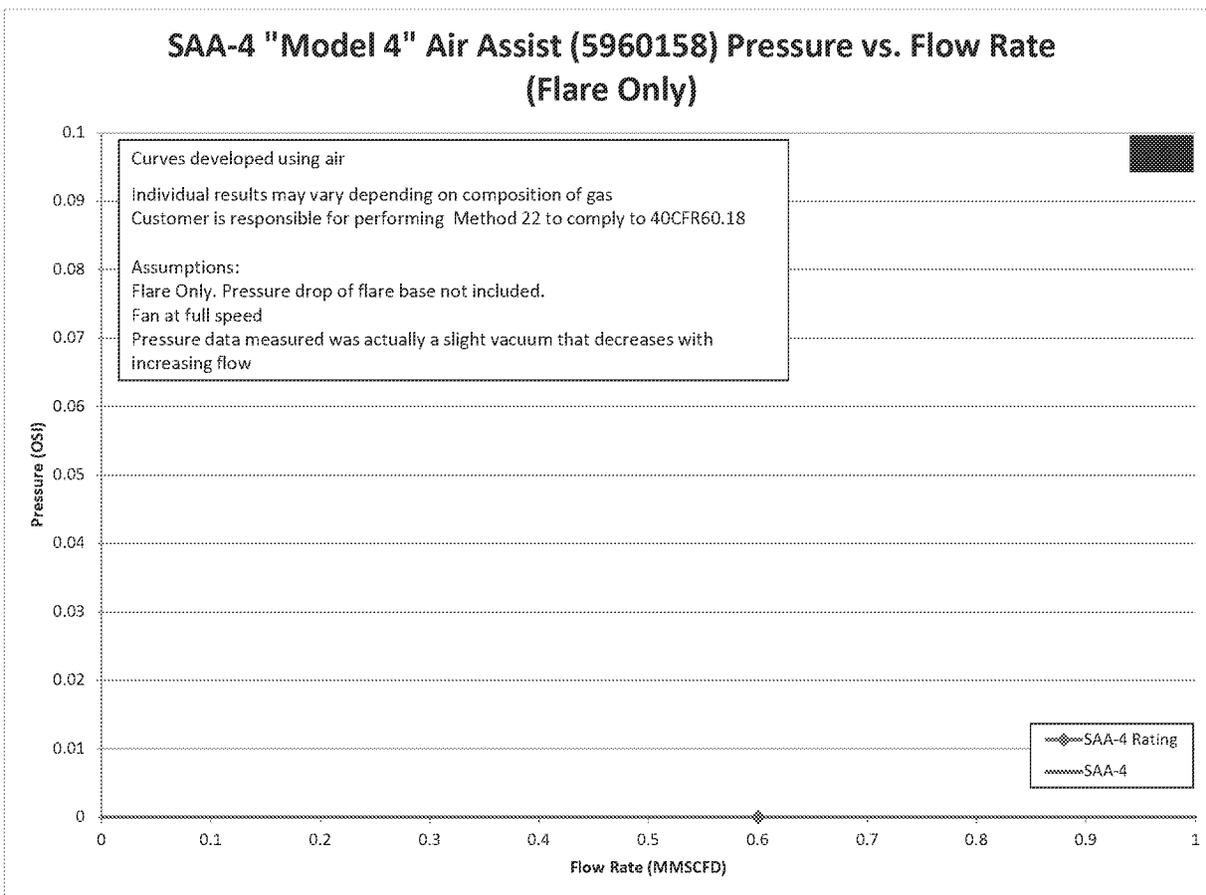


CHART 4

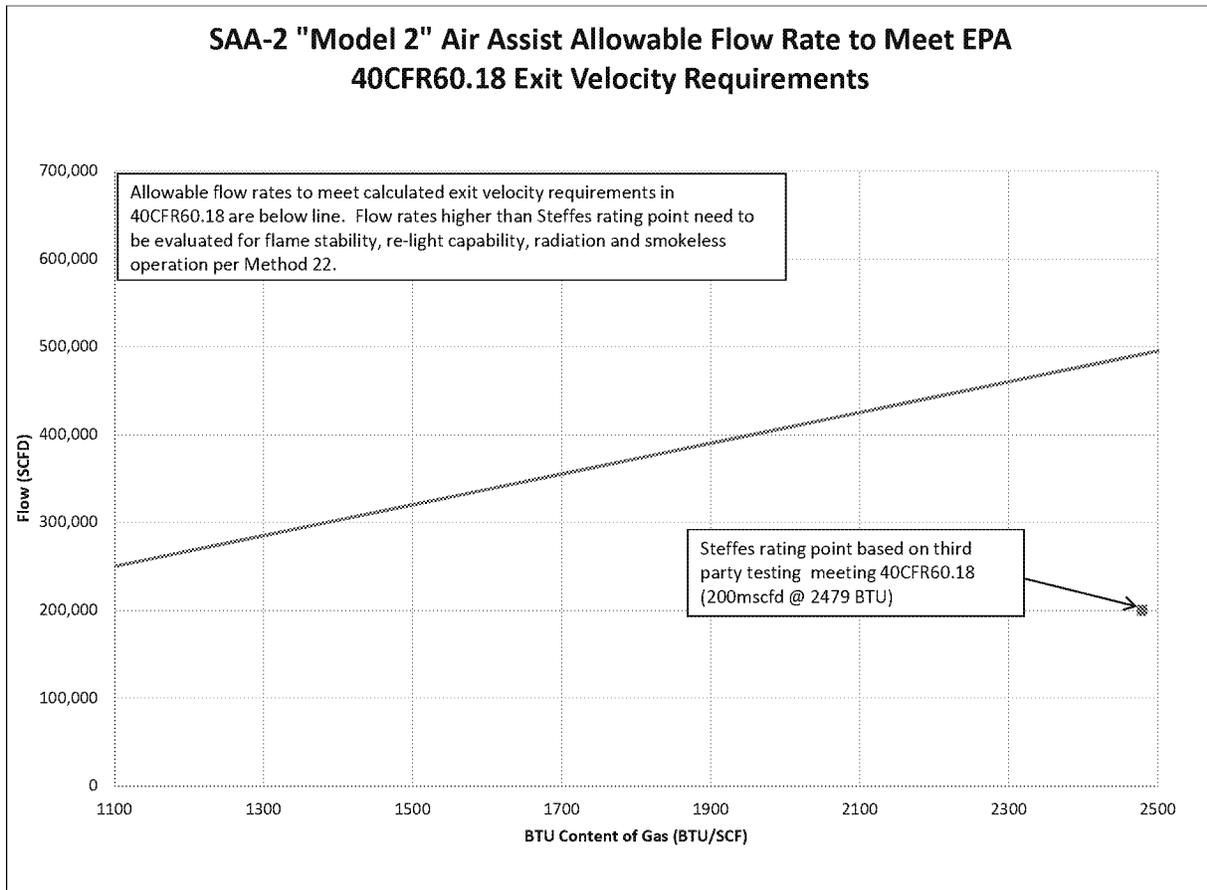
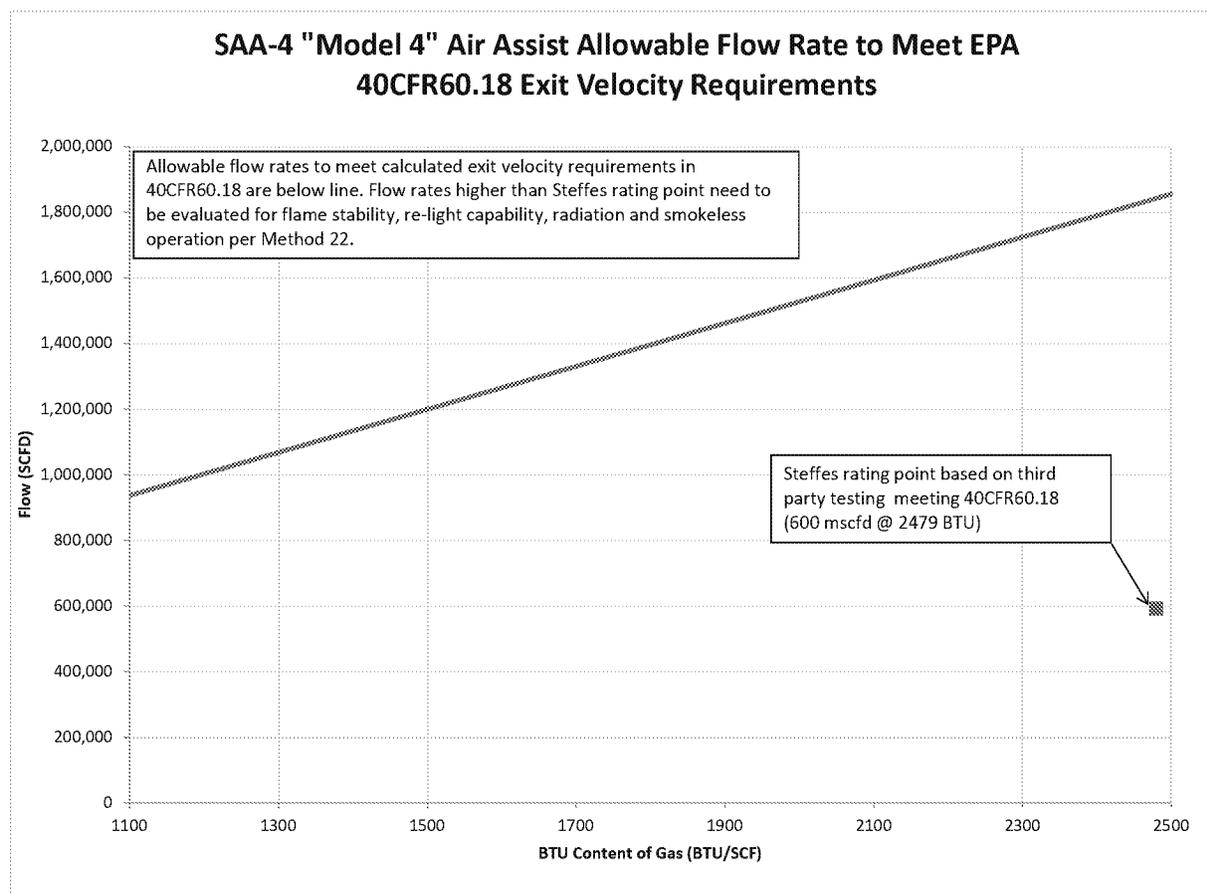


CHART 5



LOW PRESSURE FLARES	Rated Flow	Minimum Flow Rate	Gross Heating Value During Testing
Maximum Rate Tested by 3 rd Party - SVG-3B4	106 MSCFD	18,000 SCFD	1750 BTU/SCF (on-site gas)
Maximum Rate Tested by 3 rd Party - SVG-3D4	106 MSCFD	18,000 SCFD	2479 BTU/SCF (propane)
Maximum Rate Tested by 3 rd Party - SVG-3D8	120 MSCFD	18,000 SCFD	2479 BTU/SCF (propane)
Maximum Rate Tested by 3 rd Party - SAA-2	200 MSCFD	0	2479 BTU/SCF (propane)
Maximum Rate Tested by 3 rd Party - SAA-4	600 MSCFD	0	2479 BTU/SCF (propane)

*Low Pressure curves represent testing data done with air as a medium, and pressure was measured at the test port on tip.

*Low Pressure Flares (SVG-3B4, SVG-3D4, and SVG-3D8) meet requirements of 40 CFR 60.18 up to flow rates of 750 mscfd if verification of smokeless operation is confirmed by method 22.

*Flares are designed to operate with 1100 to 2500 BTU/SCF gas. Performance can be affected by specific gas composition.

*Low Pressure curves represent the nominal to max pressure.

*Data is for reference only.

*Smokeless operation is achieved by building pressure in the flare, and the Minimum Rate is defined as typical flow required to begin building pressure in flare barrel. Minimum Rate can be effected by conditions restricting the proper seating of the translating tip and the barrel resulting in lower operating pressures. Flares operating at pressures less than those shown on chart can still meet the requirements of 40 CFR 60.18 if verification of smokeless operation is confirmed by Method 22.

Third Party has also confirmed the presence of a standing pilot flame monitored by a thermocouple on all Steffes flares in compliance with EPA 40 CFR 60.18.

CHART 6

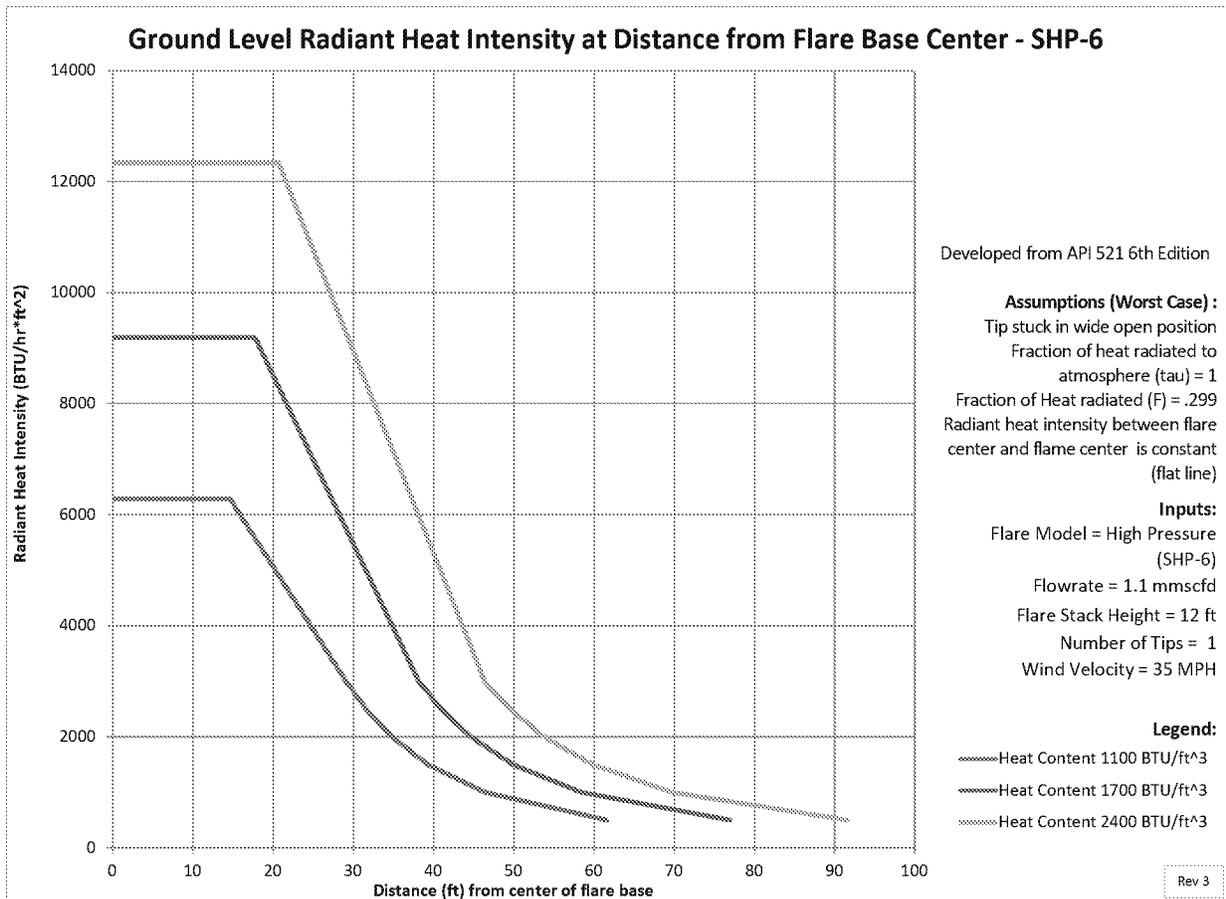


CHART 7

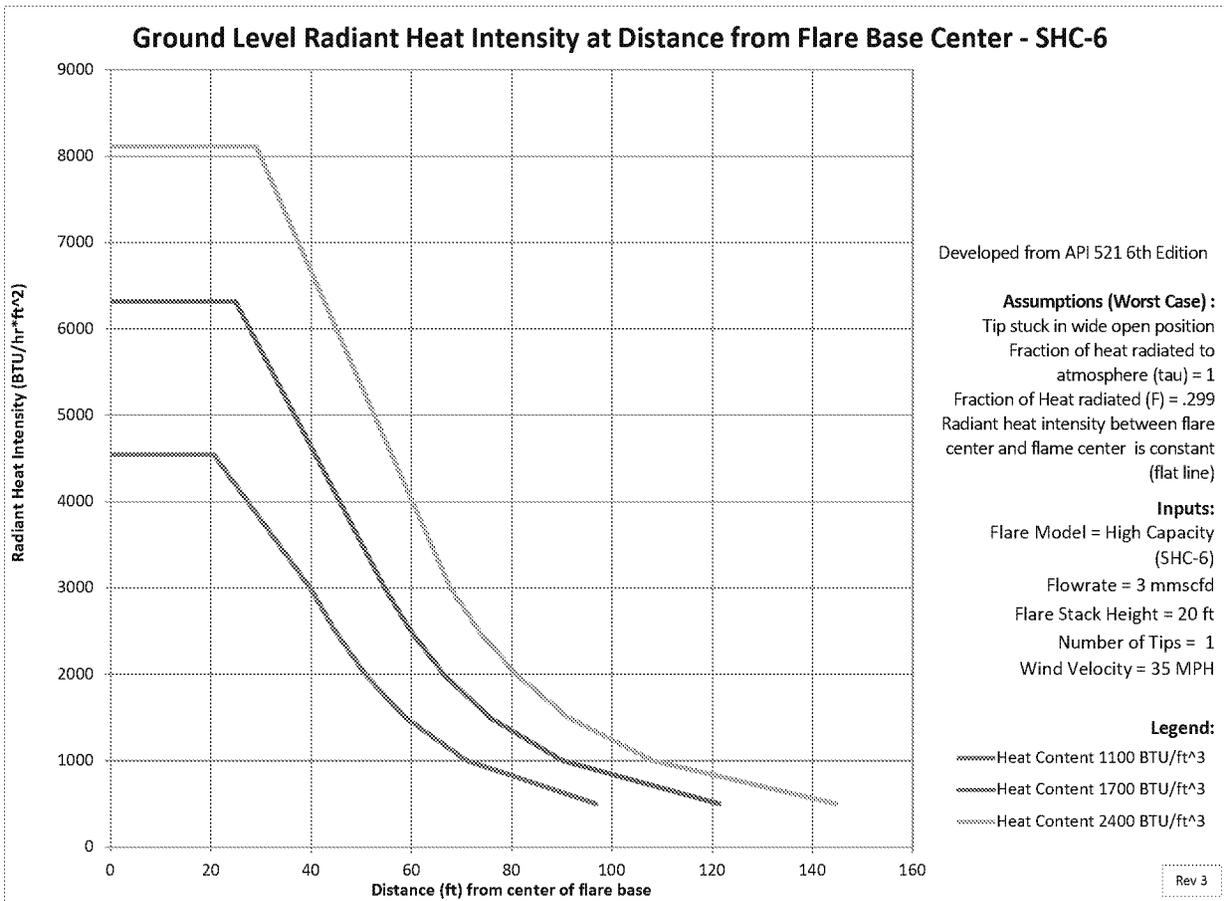


CHART 8

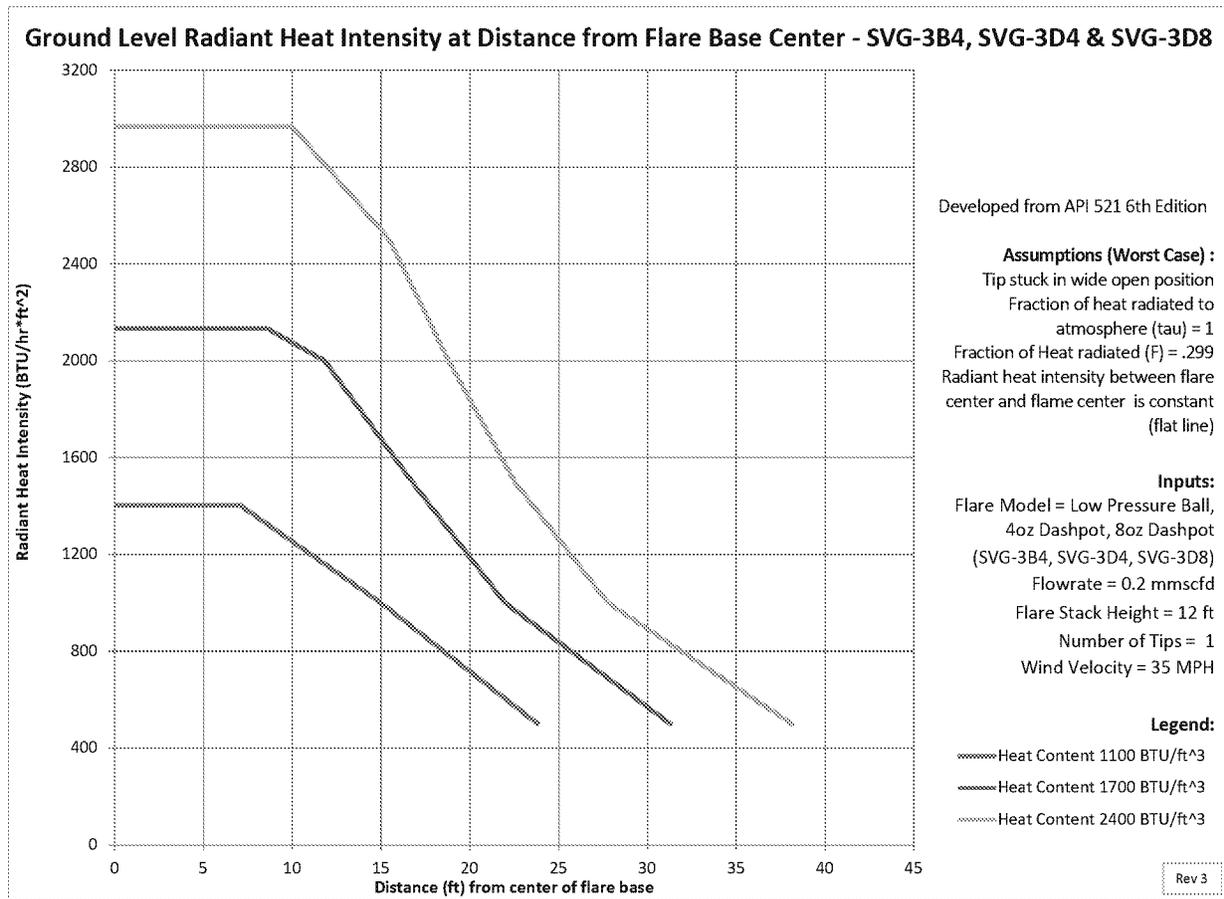


CHART 9

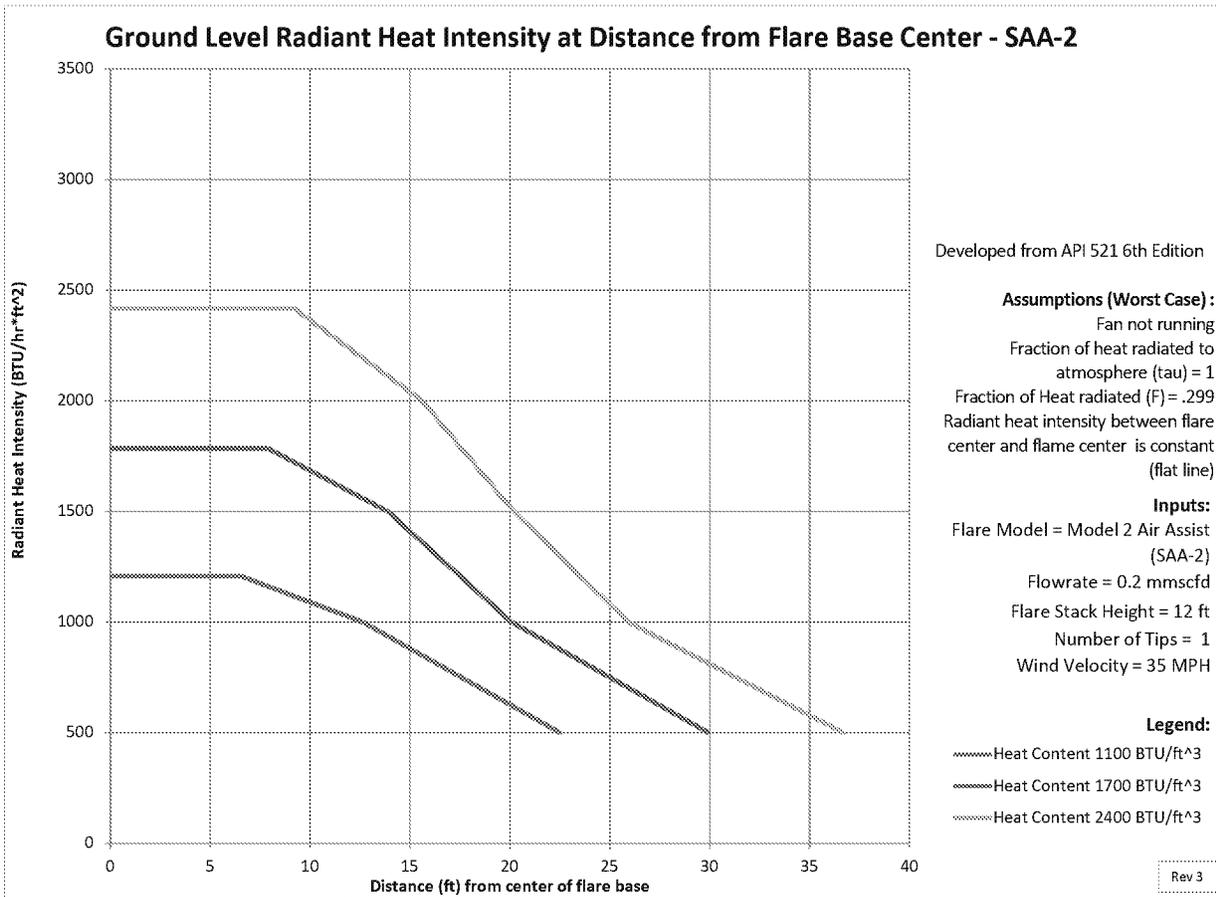


CHART 10

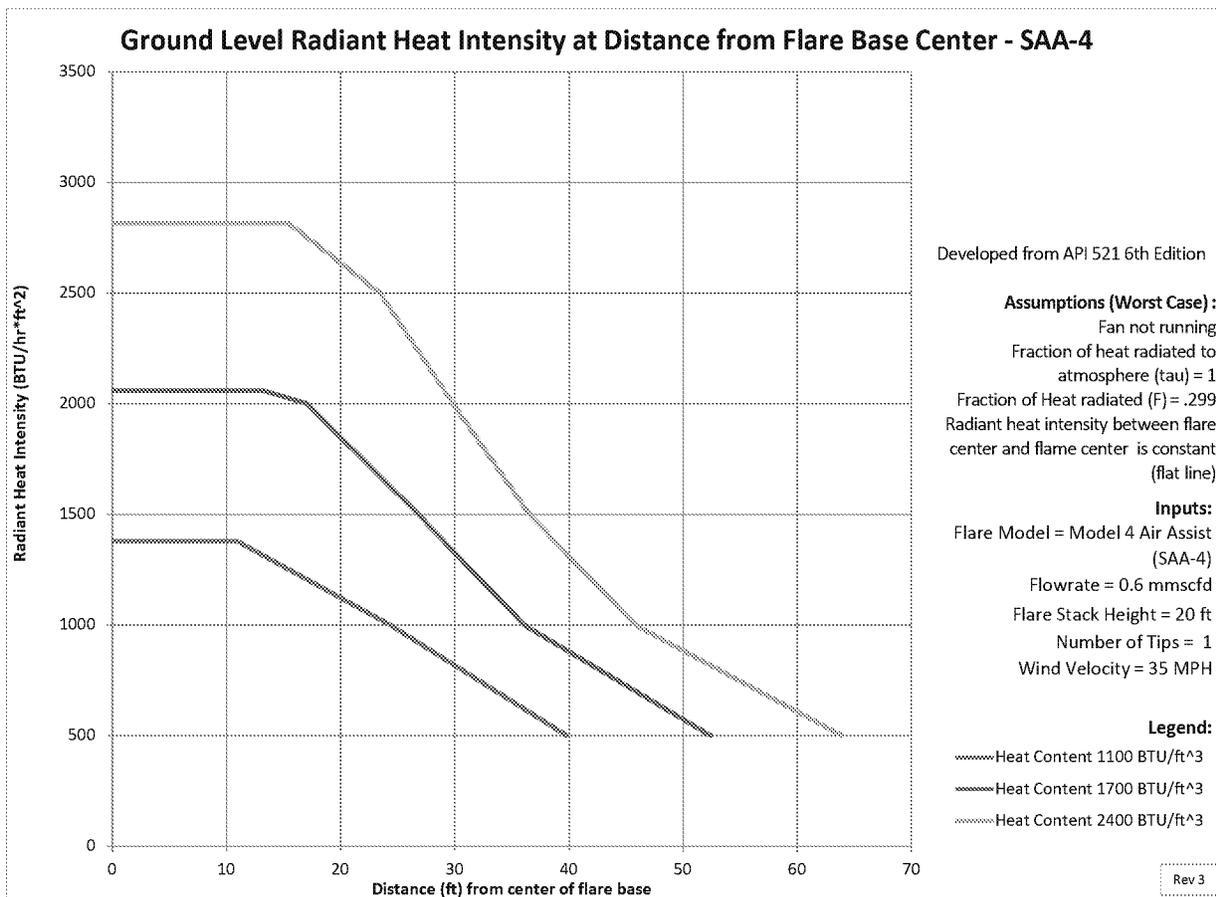


CHART 11

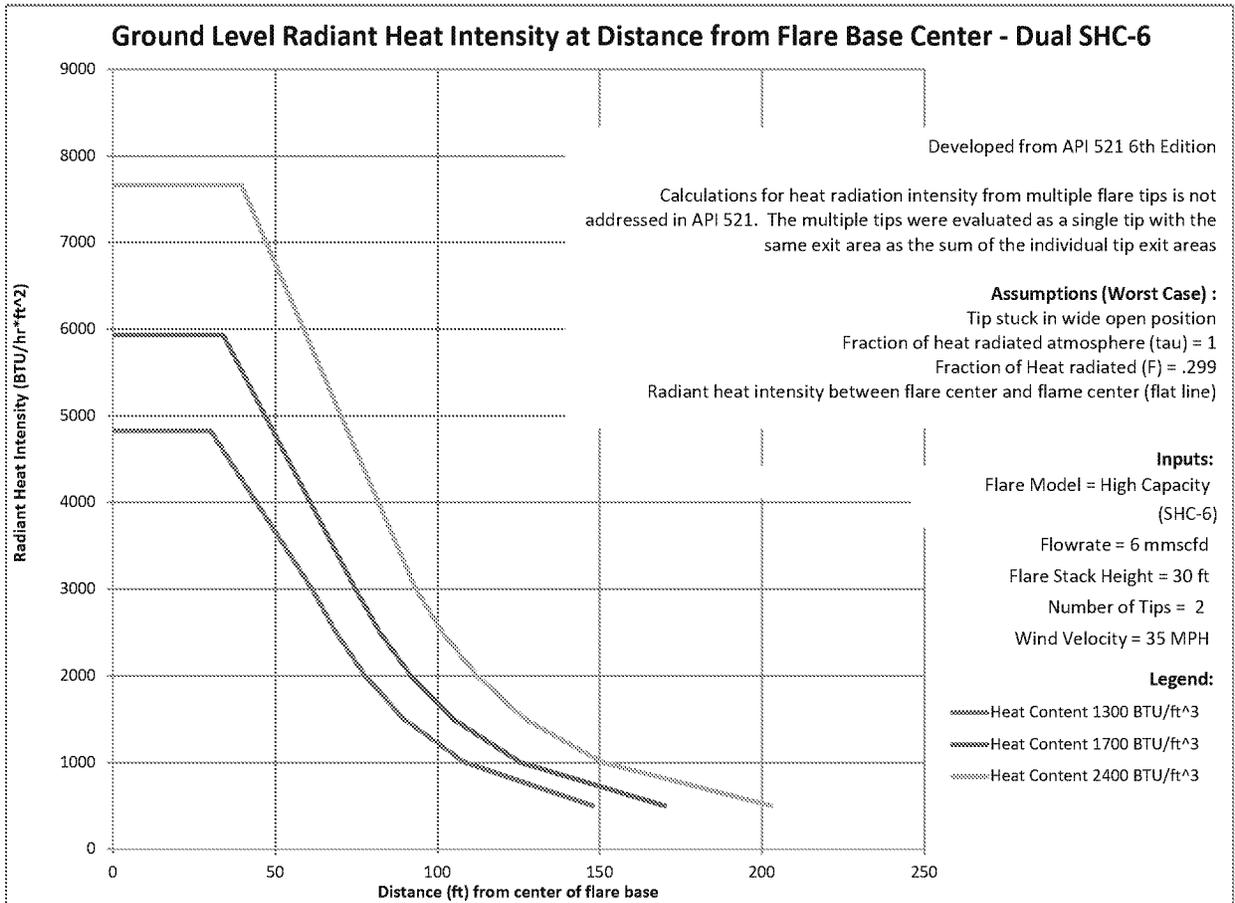


CHART 12

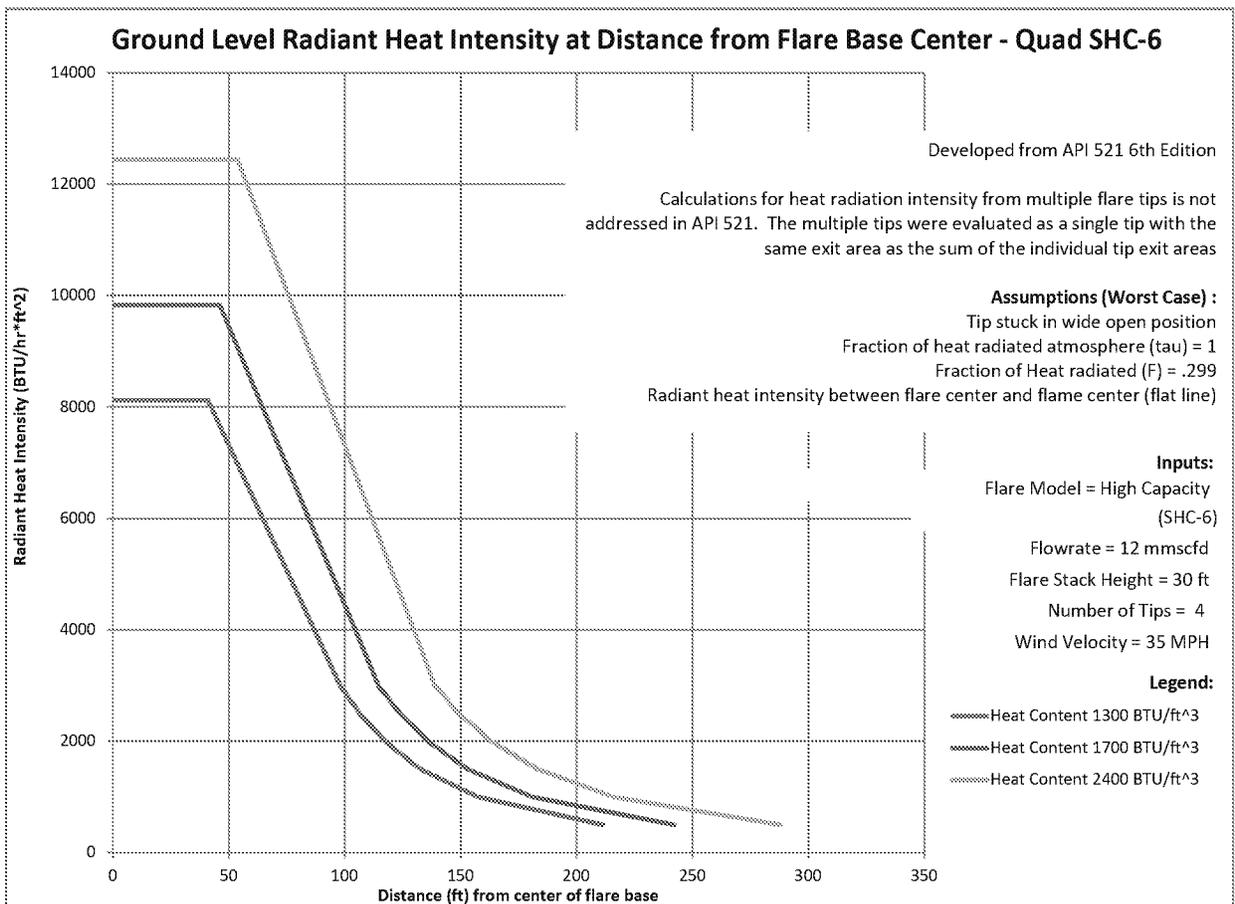
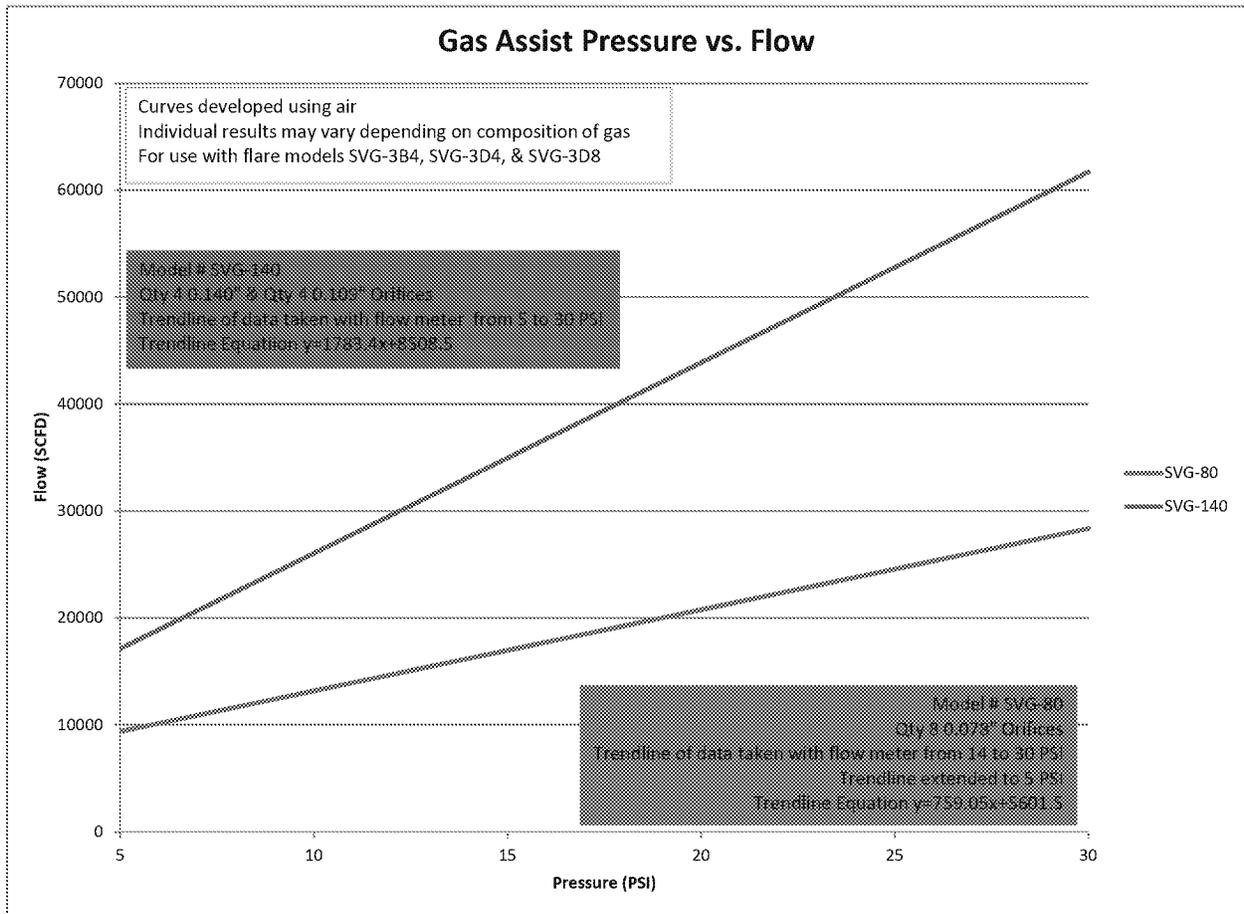


CHART 13



The Gas Assist is used to reduce smoke from low pressure flares, in cases when the BTU of gas is too high, the flow rate is too low or the flow rate is too high. Intended to fit low pressure models of the Variable Orifice Flares: SVG-3B4, SVG-3D4 and SVG-3D8.

Test data based on propane.

Data is reference only. Call factory for more specifics.